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- Table tilt: 45° R, 10° L
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- Max. cutting height: 6"
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- Blade speeds: 1800 & 3100 FPM
- Approx. shipping weight: 247 lbs.

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- Motor: 2 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 17" sq.
- Table tilt: 45° R, 10° L
- Cutting capacity/throat: 16¼"
- Max. cutting height: 12⅛"
- Blade size: 131½" L (⅛"–1" W)
- Blade speeds: 1700 & 3500 FPM
- Quick-release blade tension lever
- Approx. shipping weight: 342 lbs.

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- Motor: 1 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 14" sq.
- Table tilt: 45° R, 15° L
- Cutting capacity/throat: 13½"
- Max. cutting height: 6"
- Blade size: 92½"–93½" L (⅛"–¾" W)
- Blade speeds: 1500 & 3200 FPM
- Approx. shipping weight: 196 lbs.

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G0555P ~~$545.00~~ **ONLY $525.00**

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17" 2 HP HEAVY-DUTY BANDSAW

- Motor: 2 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 17" sq.
- Table tilt: 45° R, 10° L
- Cutting capacity/throat: 16¼"
- Max. cutting height: 12⅛"
- Blade size: 131½" L (⅛"–1" W)
- Blade speeds: 1700 & 3500 FPM
- Quick-release blade tension lever
- Approx. shipping weight: 346 lbs.

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Polar Bear Series

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19" HEAVY-DUTY BANDSAWS

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision-ground cast iron table size: 26¾" x 19"
- Table tilt: 45° R, 5° L
- Cutting capacity/throat: 18¼"
- Max. cutting height: 12"
- Blade size: 143" L (⅛"–1¼" W)
- Blade speeds: 1700 & 3500 FPM
- Approx. shipping weight: 460 lbs.

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10" LEFT-TILTING CONTRACTOR-STYLE TABLE SAW

with Riving Knife

- Motor: 1½ HP, 110V/220V, single-phase
- Precision-ground cast iron table with wings
- Table size: 25¼" x 40" • Arbor: ⅝"
- Arbor speed: 4000 RPM
- Capacity: 3⅛" @ 90°, 2¼" @ 45°
- Rip capacity: 30" R, 12" L
- Approx. shipping weight: 208 lbs.

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FREE 10" CARBIDE-TIPPED BLADE

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G0732 ~~$795.00~~ **SALE $650.00**

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10" HYBRID TABLE SAW

BEAUTIFUL WHITE COLOR!

Polar Bear Series

CSA C US 232857

- Motor: 2 HP, 110V/220V, single-phase
- Precision-ground cast iron table with wings measures: 27" x 40"
- Arbor: ⅝" • Arbor speed: 3850 RPM
- Capacity: 3⅛" @ 90°, 2³⁄₁₆" @ 45°
- Rip capacity: 30" R, 12" L
- Quick-change riving knife
- Cast iron trunnions
- Approx. shipping weight: 416 lbs.

INCLUDES BOTH REGULAR & DADO BLADE INSERTS

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10" LEFT-TILTING TABLE SAWS

with Riving Knife & Cast Iron Router Table

- Motor: 3 HP or 5 HP, 240V, single-phase
- Precision-ground cast iron table size with wings: 27" x 48"
- Arbor: ⅝"
- Cutting capacity: 25⅝" R, 8" L
- Max. depth of cut: 3" @ 90°, 2⅛" @ 45°
- Approx. shipping weight: 550 lbs.

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- Motor: 3 HP, 220V, single-phase
- Precision-ground cast iron table
- Table size with extension: 27" x 74¾"
- Arbor: ⅝" • Arbor speed: 4300 RPM
- Max. depth of cut: 3⅛" @ 90°, 2³⁄₁₆" @ 45°
- Max. rip capacity: 50" R, 12" L
- Max. dado width: 13⁄16"
- Approx. shipping weight: 557 lbs.

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FREE 10" CARBIDE-TIPPED BLADE

3 HP LEESON® MOTOR!

CSA C US 232857

G0691 ~~$1595.00~~ ONLY **$1525.00**

$150 shipping

FLOOR-MODEL OSCILLATING SANDER

- Motor: 1 HP, 110V, single-phase, 6.9A
- 1725 RPM spindle speed (no load)
- 19¹¹⁄₁₆" diameter cast iron table
- Spindle oscillation: 52 OPM
- 3 Rubber sanding drums: ¾" x 4½", 2" x 9", and 3" x 9"
- 3 Sanding sleeves: ¾" x 4½", 2" x 9", and 3" x 9"
- Table inserts: 6
- Floor to table height: 36¾"
- Dust port: 2"
- Toggle ON/OFF safety switch with locking tab
- Includes two wrenches for easy spindle changes
- Approximate shipping weight: 143 lbs.

T26418 ~~$475.00~~ SALE **$425.00**

$79 shipping

12" JOINTER/PLANER COMBINATION MACHINES

- Motor: 5 HP, 220V, single-phase
- Jointer table size: 14" x 59½"
- Cutterhead dia.: 3⅛"
- Cutterhead speed: 5034 RPM
- Max. jointer depth of cut: ⅛"
- Max. width of cut: 12"
- Planer feed rate: 22 FPM
- Max. planer depth of cut: ⅛"
- Max. planer cutting height: 8"
- Planer table size: 12¼" x 23⅛"
- Approx. shipping weight: 704 lbs.

NEW END-MOUNTED FENCE

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WITH SPIRAL CUTTERHEAD

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G0633 JOINTER/PLANER WITH HSS KNIVES ~~$2050.00~~ ONLY **$1995.00**

G0634Z W/SPIRAL CUTTERHEAD ~~$2595.00~~ ONLY **$2550.00**

24" DRUM SANDER

- Motor: 5 HP, 220V, single-phase drum motor drives 2 aluminum sanding drums
- Surface speed of drum: 2300 FPM
- Handles stock up to 23½" wide and 4¼" thick
- ¼ HP Conveyor motor provides 11 FPM feed rate
- Sandpaper installs easily onto the drums
- Sanding drum size: 6"
- All steel and ball bearing construction
- Two 4" dust ports for easy hook-up to a collection system
- State-of-the-art computer balanced drums
- Powder-coated paint
- Approximate shipping weight: 442 lbs.

G1066R ~~$1695.00~~ SALE **$1595.00**

$99 shipping

HEAVY-DUTY MORTISER WITH STAND

- Motor: 1½ HP, 110V/220V, single-phase, TEFC, 1725 RPM, prewired 110V
- Amps: 14A at 110V, 7A at 220V
- Table size: 19" x 12½" • Vertical spindle travel: 9"
- Head vertical travel: 3" • Table longitudinal travel: 14½"
- Table cross travel: 3" • Column tilt: ±30°
- Fence angle: 0–30° • Chisel capacity: ¼"–1½"
- Maximum chisel stroke: 6¼"
- Maximum workpiece width: 9"
- Chuck capacity: ½"
- Collar size: ⅝" and ¾"
- Spindle speed: 1725 RPM
- Overall size: 36" wide x 71" high x 24" deep
- Approximate shipping weight: 356 lbs.

STAND INCLUDED

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G0448 ONLY **$1495.00**

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VARIABLE SPEED PLANER/MOULDER

SHOP FOX

- Motor: 2 HP, 240V, single-phase, 12 Amps
- Precision-ground cast iron table and wings
- Maximum cutting width: 7"
- Maximum planing height: 7½"
- Maximum planing depth: ⅛"
- Maximum moulding depth: ¾"
- Feed rate: Variable • Cutterhead type: Square
- Knife size: 7⅛" x 1½" x ¼" HSS
- Cutterhead speed: 7000 RPM • 4" dust port
- Rubberized steel feed rollers • Powder-coated finish
- Approx. shipping weight: 324 lbs.

CSA C US 177335

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W1812 ~~$1650.00~~ SALE **$1525.00**

$99 shipping

CYCLONE DUST COLLECTOR

- Motor: 1½ HP, 110V/220V, single-phase, TEFC, 3450 RPM
- Air suction capacity: 775 CFM
- Static pressure at rated CFM: 1.80"
- Intake port: 6" with included 5" optional port
- Impeller: 13½"
- Height: 65½"
- Built-in remote control switch
- Approx. shipping weight: 210 lbs.

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- Motor: 2HP, 240V, single-phase, 3450 RPM
- Motor amp draw: 9 Amps
- Air suction capacity: 1550 CFM
- Static pressure: 11"
- 6" inlet has removable "Y" fitting with two 4" openings
- Impeller: 12¾" balanced cast aluminum
- Bag capacity: 5.7 cubic feet
- Standard bag filtration: 2.5 micron
- Portable base size: 21¼" x 33½"
- Bag size (dia. x depth): 19½" x 33"
- Powder-coated finish
- Height with bags inflated: 78"
- Approx. shipping weight: 122 lbs.

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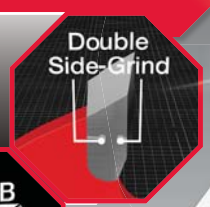
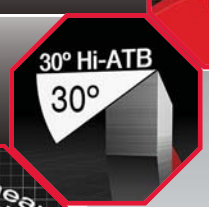
design for delivering polished cross cuts



30° Hi-ATB
for slicing through plywood and melamine



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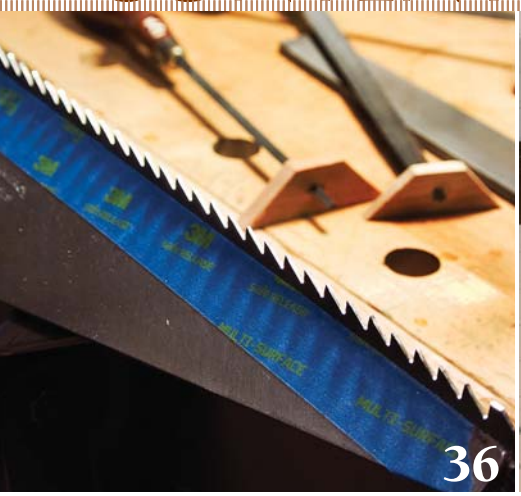

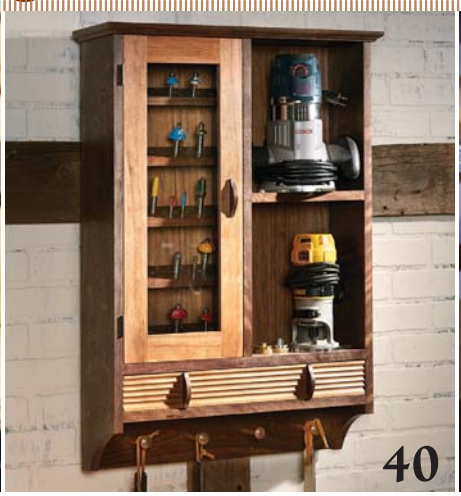

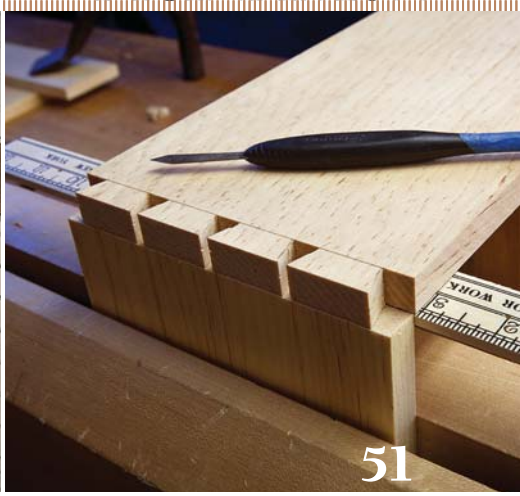

FEATURES

SAW SHARPENING PHOTO BY RIC DELIANTONI; ROUTER CABINET PHOTO BY AL PARRISH; DOVETAIL PHOTO BY CHRISTOPHER SCHWARZ; CARVING PHOTO BY MARY MAY

DECEMBER TO REMEMBER HOLIDAY SWEEPSTAKES!

To celebrate the holiday season, *Popular Woodworking Magazine* and its sponsors are giving away a prize a day throughout December. To earn your chance, you must enter separately for each day's prize. All entrants will qualify for the Grand Prize: a JET 10" ProShop Table Saw (Model 708494K) with 30-inch fence, cast iron wings and riving knife.

ENTER NOW for your chance at more than $9,000 in prizes with a winner every day!

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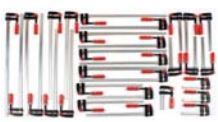

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Enter every day at popularwoodworking.com/holiday

Popular Woodworking Magazine and its sponsors will award one prize each day from December 1 through December 31. The prize pictured on each day in the calendar above is the prize offered for that day. To register for a chance to win each prize, you must enter on the day the prize is offered. You may enter as many of the daily contests as you like, but are limited to one entry per day. All entries from the first 30 days will be eligible for the Grand Prize: the JET 10" ProShop Table Saw (Model 70849K).

Registration starts midnight EST, December 1, 2014 and ends 11:59 PM EST, December 31, 2014

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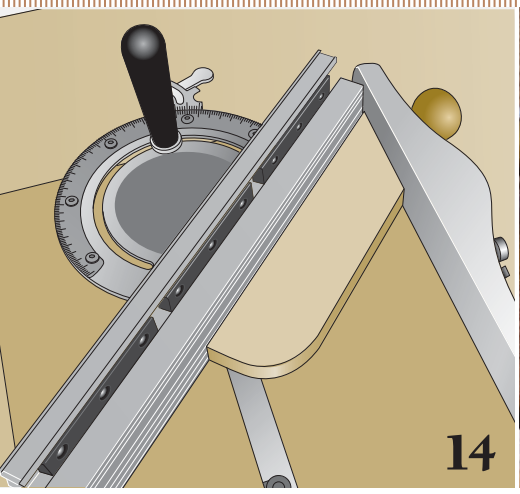

REGULARS

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Inside Baseball

I was surprised to discover at Woodworking in America in September the number of people who are interested in how this magazine gets put together. I titled my session "How the Sausage Gets Made" – not realizing that phrase isn't quite as common as I'd thought. It refers to the behind-the-scenes production of that tastiest of treats: sausage (with apologies to the vegetarians among you). Sometimes it's better to just not know what went into making it; best to just enjoy the end results.

Instead of lunch (my condolences to those who were expecting it), I served up a feast of magazine history, planning spreadsheets, query guidelines, bad article examples, good article examples...in short, everything that goes into putting this magazine together.

But perhaps most salient, I returned to my teaching roots to share with attendees what I – and many magazine editors – look for in a query (article proposal). Because while we do for the most part rely on a cadre of well-known and highly respected professional woodworkers and woodworking teachers for the articles and columns in this magazine, we also accept unsolicited queries. There are, after all, plenty of people producing world-class woodworking in obscurity, and we want to help share their talent (are you one of those people? Read on!).

First, give a thorough read to at least a couple recent issues of the magazine to get a feel for the types of articles therein. Don't send queries that don't seem to fit with the editorial focus of the publication.

While, for example, I like a good pergola and admire the many excellent designs thereof I've received as queries, we don't publish articles on building structures. Ditto on yard art.

Second, at least skim the previous three years' worth of not only the magazine in which you want to be published, but also skim the competitors. Don't send queries on things similar to those recently published, anywhere.

Third, state your bona fides. In other words, convince us you're the best person to craft the story, both as a woodworker and a writer.

Fourth (and this may be specific to us), include print-worthy sample digital images; we require authors to provide their own "step" photos (the smaller ones in the articles) and, ideally, the opening shot as well. And, if at all possible, a SketchUp model of a proposed build is greatly appreciated (though not strictly necessary). If you don't use SketchUp, a decent napkin sketch will do in a pinch.

Fifth, write from the heart; don't feel beholden to the "proper" style you learned in grade school. In other words, make it interesting to read (within the bounds of making sense). We want to see your personality and love of the craft come alive on the page. (Also, it's OK to use contractions.)

And finally, have someone edit your query before hitting "send." No one is his or her own best editor. (And by the way, my last name is Fitzpatrick, not Fitzgerald...though that common error amuses me.) **PWM**

PHOTO BY CHRISTOPHER SCHWARZ

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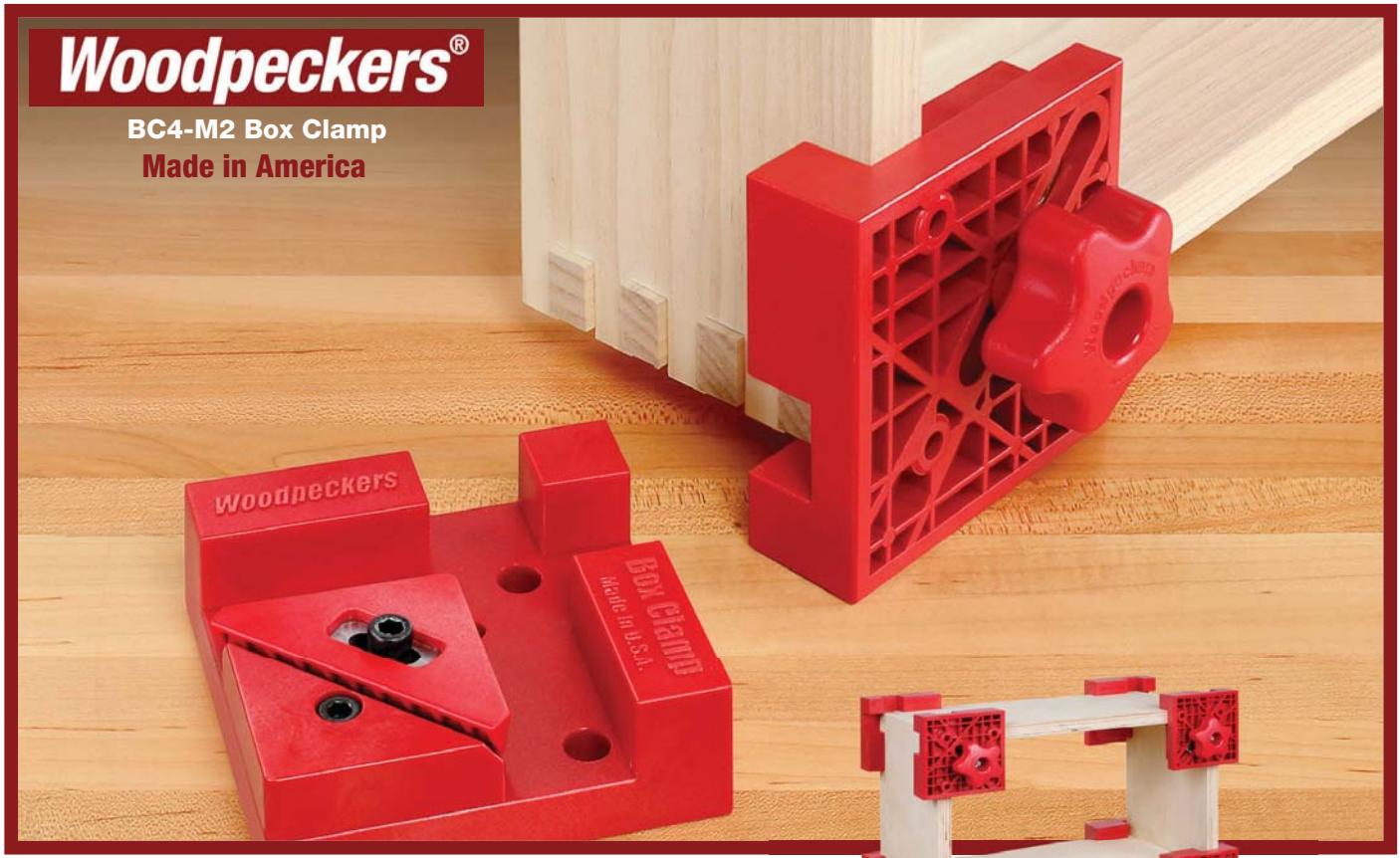

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Saw Storage Solutions For a Tool Chest

I remember Megan Fitzpatrick's blog post, "Racked with Indecision," about saw storage in a full-size English tool chest. I have questions:

1) How do you like that setup?

2) Do you have to worry about the backsaws hitting together if you roll the chest around?

3) Is the saw rack constructed with rectangular spaces behind the rack where you put chisels and such, and saws just hang from the totes between the spacers?

Brad Heck
via e-mail

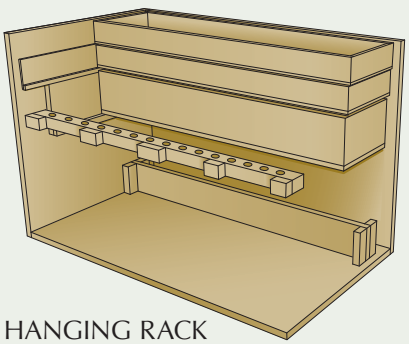
Brad,

I prefer my setup over the one Christopher Schwarz shows in "The Anarchist's Tool Chest," which has a saw till on the chest's bottom. My saw rack frees up floor space and keeps the backsaws tucked against the wall out of the way.

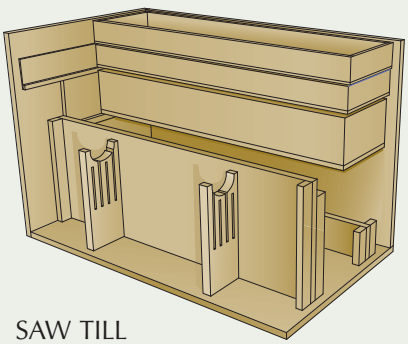
As far as them hitting together when I move the chest, well, I almost never move it. But were that a concern, I suppose I could attach a keeper bar (a narrow piece of wood with appropriately placed slots) about 5" down from the top slots, into which the saw toes could slip to keep them from moving much.

The construction is simple. As you surmised, I have a strip of wood with a row of holes drilled through it, into which I can insert chisels and other pointy tools; it's blocked out from the wall with five 5/8"-thick or so pieces, between which the saws go. They do just hang on their totes. If you go this route, make your spacer blocks slightly narrower than the width of your saw handles, so that when you insert the saws, they hang straight down.

Megan Fitzpatrick, editor



HANGING RACK



SAW TILL

Band Saw Guides

In the "Illusion Cabinet" article by Gary Rogowski (October 2014, #213), there are two pictures where Gary is ripping a board on the band saw.

In both pictures, the blade guide is several inches above the workpiece. I've always lowered the guide close to the wood.

Can you comment on the technique illustrated in those two pictures? Does it help somehow in staying on the line?

Lowell Holmes
via e-mail

Lowell,

On the Yates American band saw shown in the article, the guard is raised to make things more visible at that angle. For the taper cuts on my Laguna, I keep my blade guard at a height just above my fence for most of my cuts. This way I can get the fence close to the blade.

The guard height doesn't help me one way or the other as far as accuracy is concerned. In a straight cut, it's the sharpness of the blade and how it is tracking that determine accuracy. The rear thrust bearing/plug stays in the same location relative to the blade no matter how the guard is positioned. The side guides are not in use in a straight cut.

Gary Rogowski, contributor

When Dull is Good

Can you tell me what would be an equivalent to your "dull-rubbed effect" lacquer? I will be using a water-based lacquer and have looked into Target Coatings' EM6000 and General Finishes' Enduro Lacquer. Do you know if either have a finish that would equal or at the least come close to yours? I know they are available in satin and flat, but don't know how it matches up. In the book that I have, the pictures were done beautifully, but I still don't know enough to know a "dull-rubbed effect" lacquer if I saw one.

Bill Antonacchio
via e-mail

Bill,

I typically use shellac to build my finish, then I decide how I want to knock down the sheen – shellac is far too glossy for reproduction furniture, and a low sheen helps hide imperfections. If you do the same, then you have a few options that I know will work.

The first is to apply a coating of dull-rubbed effect lacquer after sanding the shellac with #400 or #320 grit sandpaper.

Another option is to rub out the shellac using #0000 steel wool. This provides a dull sheen similar to the lacquer. I find this acceptable with smaller projects. (I just completed a semi-tall chest using this technique, but for larger projects this technique is labor-intensive.)

A third option is to sand the shellac, then apply a wipe-on satin finish. I've used the Enduro satin water-based lacquer

CONTINUED ON PAGE 12

ILLUSTRATIONS BY MARY JANE FAVORITE

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CONTINUED FROM PAGE 10

with great results. The look when dry is very close to my dull-rubbed look.

In fact, I've used the Enduro water-based product (though not applied over shellac) on the router cabinet featured in this issue (see page 40).

Glen Huey, contributing editor

Hidden Compartments

I'm curious as to why Christopher Schwarz didn't add any hidden or secret compartments in the folding bookcase project (October 2014, #213). A place to hide a document or some jewelry or coin might be a fun addition.

Are secret compartments period-accurate for campaign furniture?

Albert Gauche
Springfield, Oregon

Albert,

Who says there aren't any secret compartments in the bookcase?

In researching campaign furniture, I did find evidence that campaign pieces would hold the occasional secret compartment. These were usually in the secretaries, lap desks and Davenports.

So feel free to add a false bottom, back or whatever to your bookcase.

Christopher Schwarz, contributor

Breadboard Security

I just made a breadboard end using three tenons over a 36"-wide dining table, but I had plenty of room for more. After reading the article on breadboard ends (October 2014, #213), I was wondering, is there a rule of thumb for how many tenons you should make?

Shannon Rogers
Bel Air, Maryland

Shannon,

I have no rule of thumb for this stuff. On something 36" wide I have gone with either three or four tenons spaced across the width. More than that, and I think you're running the risk of losing integrity in the breadboard end because you have so little meat between the mortises.

It's a balancing act. More tenons means better hold on the main board, but also means a weaker breadboard; fewer tenons means a stronger breadboard but less hold on the main board. **PWM**

Chuck Bender, senior editor

Portable Bookcase Correction

The front view of the illustration for the "Folding Bookcase" in the October 2014 issue (#213) was inadvertently cut off on the left edge; the actual height is 27 1/4", not 7 1/4".

Megan Fitzpatrick, editor

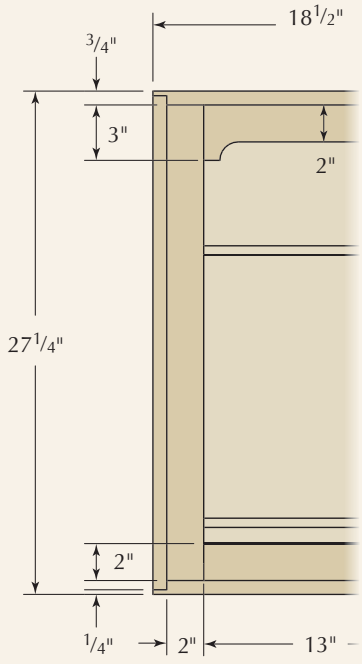

ILLUSTRATION BY ROBERT W. LANG;
PHOTO BY CHRISTOPHER SCHWARZ

ONLINE EXTRAS

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Highly Recommended

I've always had to make two cuts to cope out dovetail waste because the Olson blades I've been using are over-set for my needs; they don't fit in the thin kerf left by my dovetail saw.

But I recently got a pack of 18 teeth-per-inch skip-tooth Pegas blades. At .02" thick, they drop right into my dovetail saw kerf – no more swooping in from both sides; that's time saved. So far, I've cut joints for three boxes with one blade; it's still sharp. I'm sold. (Available at knewconcepts.com.)

— Megan Fitzpatrick

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Safety Note

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking Magazine*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand.

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THE WINNER:

Miter Gauge Shooting Board

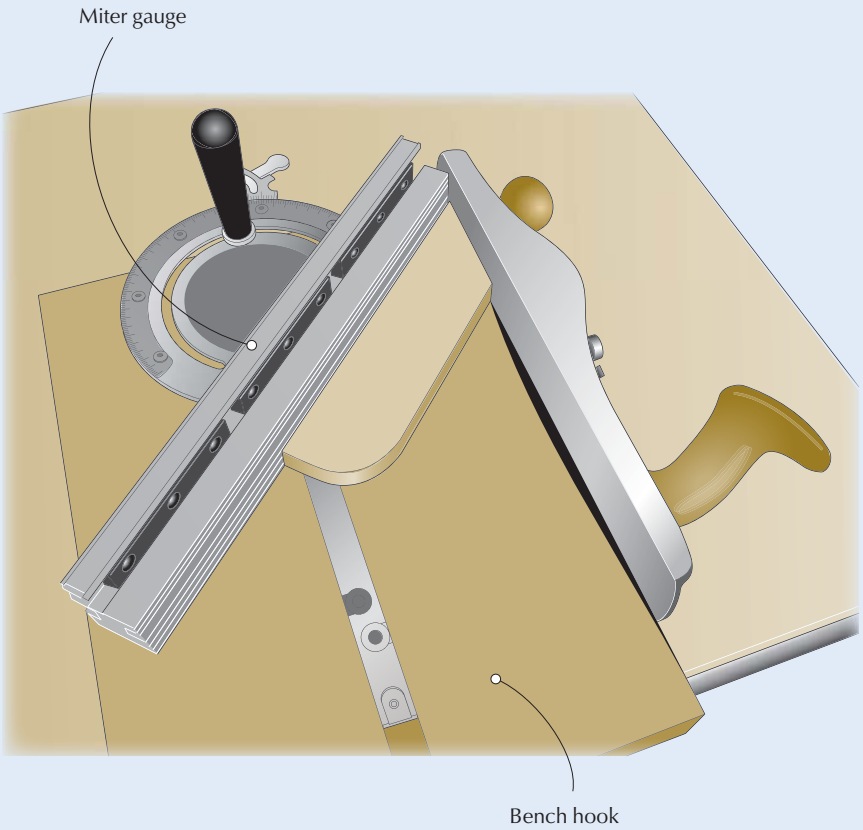
While I have a shooting board with a 90° fence, any other angle requires fussing with wood, screws and a protractor. In a moment of desperation, I cut a groove down the center of an old bench hook that matched the standard miter groove on my table saw and dropped in my miter gauge.

I had to unscrew the T-slot guide from the end of the gauge, but this provided a perfect, non-destructive way of anchoring it in the slot using a countersunk screw into the bench hook.

I calibrated the fence against the edge of the bench hook in the same way you would if using the miter gauge in the table saw: Loosen the calibration screws on the gauge, grab a square, nudge the fence until it's 90°, then lock the calibration screws.

The shooting board now has a fence with a built-in protractor, and positive stops for more angles than a politician running for office.

Barak Bruerd
Pulaski, Tennessee

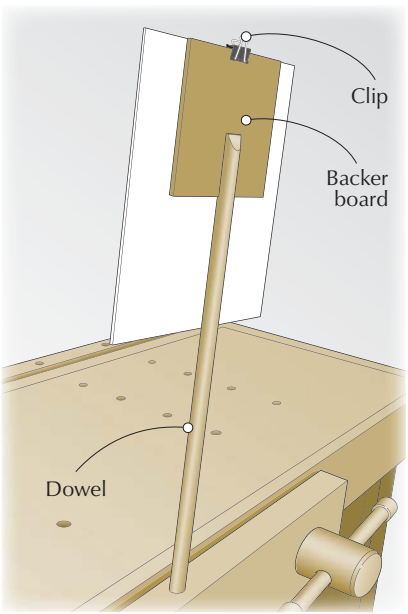


Bench Dog Reader

When I work at the bench from drawings or items such as manuals, they often get in the way and take up valuable bench space. They can also get stained or torn.

I use a dowel rod the size of my bench dog holes with a clipboard area attached and clip the messy paperwork there. I insert the dowel in any convenient dog hole. It can easily be moved around and saves wear and tear on valuable plans and documents.

Don Henderson
Orleans, Ontario



Protect Your Paint Brushes

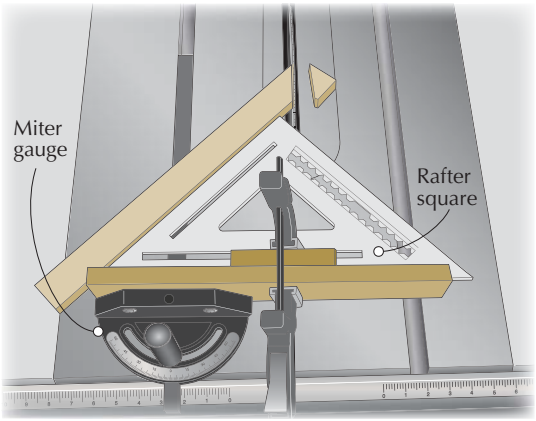
My father always took good care of his paintbrushes, cleaning them after each use and storing them in newspaper. I did the same with my brushes until recently.

I found that a flattened toilet tissue tube fits nicely around a 2" brush (the most common size). After cleaning the brush, I insert it handle-first into the tube. Clamp a large binder clip to the end of the tube. The bristles of the brush are then protected from dust and dirt. The clip also makes it easy to hang it from my pegboard. My father is gone now, but I'm sure he wouldn't mind my slight improvement to his idea.

David Long
Lexington, Kentucky

ILLUSTRATIONS BY MARY JANE FAVORITE

Foolproof Rafter-Square Miters



The framing triangle, sometimes called a rafter square, is usually used in construction, but I find it a safe and valuable tool for layout tasks on the table saw. It is basically a 1/4"-thick plastic drafting triangle with a flange on one edge; I cut off one side of the flange so the triangle can lie flat on the saw table.

One neat trick is using the framing triangle and the saw's miter gauge to make foolproof 45° miter joints. And I don't mean a precise aftermarket miter gauge; I mean the standard imprecise miter gauge that comes stock on most saws.

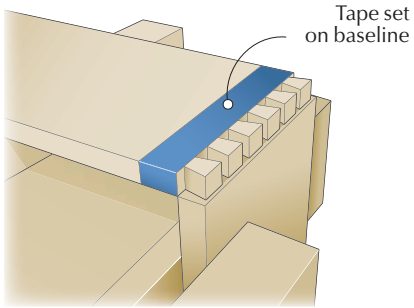
Typically, a square frame with mitered corners requires eight 45° cuts. Any error in the miter gauge is multiplied by eight; a 1/2° error become a 4° error. But by using a triangle as an auxiliary fence, you can make these errors cancel out.

Simply place the square against the fence and make all your initial miter cuts. Shift the square along the fence to make your second cuts. The miters should mate perfectly.

Bill Wells
Olympia, Washington

Dovetail Tape

After cutting a set of tails, I needed a better way to align the tail and pin boards because my boards were constantly sliding out of proper alignment. I'm aware of the shallow rabbet approach, but I normally can't be bothered to take the extra work and time to make the rabbet.



I devised a quick and simple way to achieve the same result. Blue painter's tape perfectly lined up with your dovetails' baseline adds just enough thickness to hold the piece square to your pin board. It works every time.

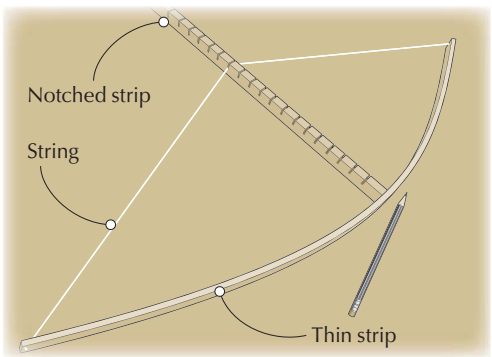
Ethan Thrasher
San Rafael, California

Arch Drawing Jig

To draw smooth, flowing curves on pieces, I use two strips of wood (one thicker than the other) in a simple jig that allows you to draw a variety of arcs with ease.

I cut notches in the thicker strip spaced at regular intervals from the end. The thinner strip is loosely strung like a bow and placed at the end of the thicker strip. The string on the thinner strip can be pulled back and hooked into a notch on the thicker strip to bend the thin piece at a specific arc. Place the assembly on the work and trace the necessary arc. PWM

Serge Duclos
Delson, Quebec



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Earlex SprayPort 6003

This turbine-driven gun produces a good finish at a good price.

I first became aware of High-Volume Low-Pressure (HVLP) systems about 20 years ago. At the time, it seemed like a great idea – reduce overspray and eliminate the need for a massive air compressor chugging away. Since then, I've tried several HVLP guns and systems, but the performance never quite matched that of a compressor-based spray gun, or there were deal-killers such as excessive price, noise or heat.

I became a convert to HVLP this summer when I spent a weekend spraying several pieces of furniture with shellac using the SprayPort 6003 system from the British manufacturer Earlex. The power unit is compact, light and powerful, and the 25' hose is flexible and easy to manage.

Inside the black box is a 1,200 watt, three-stage turbine that delivers 5.5 pounds per square inch of pressure to the gun. That's not the most powerful turbine on the market, but it's certainly enough power to deliver most furniture finishes efficiently and effectively.

The system price of about $550 is a real opportunity to step up to a quality spray finishing system for less money than a good conventional gun plus the compressor to power it.

For me, the best part of the system is the Pro-8 gun. I tested the pressure-feed cup gun (a gravity-feed gun is also available). I was expecting the constant flow of air from a bleeder gun, and was pleasantly surprised that the gun behaves much like a conventional spray gun.

No bleed. *The biggest surprise of the 6003 system is the easy-to-use, non-bleeder spray gun.*

The die-cast aluminum gun has controls conveniently located at the back, just above the handle to adjust both the volume of material and the width of the spray pattern. There are a wide range of adjustments available, something that I have found lacking in other HVLP guns.

It was easy to set the gun for optimal atomization and material flow with minimal overspray. An interesting feature of this gun is the air cap that rotates a full 360° to allow for a wider-than-average spray pattern. I didn't need additional width; for me these features meant greater adjustability for reaching difficult areas.

The gun is lightweight and felt comfortable in my hands. Combined with an excellent hose, a user can concentrate on applying finish, and not have to deal with an achy arm or wrestle to get in position for spraying.

These days there are a lot of products that are "value-engineered." Usually when I hear that phrase, I expect to see a decent product rendered nearly useless by cutting corners in all the wrong places. With this system, Earlex has done a remarkable job of delivering a high-quality product at a reasonable price.

If you're ready to step up your finishing game with the addition of an HVLP system, this outfit will meet your needs without breaking the bank.

— Robert W. Lang

CONTINUED ON PAGE 18

Earlex SprayPort 6003

Earlex ▪ earlex.com or 888-783-2612

Street price ▪ from $550

▪ **IN OUR STORE:** *"Creating Historic Furniture Finishes," by Don Williams.*

Price correct at time of publication.

PHOTOS BY AL PARRISH

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CONTINUED FROM PAGE 16

Shenandoah Tool Works Birdcage Awl

If you're in the market for a birdcage awl, this Shenandoah Tool Works version offers a stylish twist – that is, the hand-forged 01 steel shaft is actually twisted during manufacturing.

While this aesthetic touch has no effect on performance, it looks nice – and one could argue that, subliminally, it tells you the tool's primary function. The four-sided point allows you to ream a round, tapered hole by twisting the point back and forth in a hole.

Why "birdcage?" It may be apocryphal, but I've read it's because this tool was used to bore small holes for making birdcages – really!

The included angle on this tool is the same as on my other birdcage awl (Czeck Edge), but the point is longer, which comes in handy if you need to ream a pilot hole for large screws.

I also use this tool for countersinking to fit a screw head flush when I don't have a countersink handy. For that function, both of my birdcage awls work equally well – though the larger shaft on the Shenandoah tool more quickly creates a wider countersink.

The 01 steel on this tool is a little easier to sharpen than the A2 of my other one – but Bob Zajicek (Czeck Edge) now offers a carbide-tipped awl that (assuming normal use) will likely rarely need sharpening. And about sharpening: Several people have asked if the twisted blade will limit the number of times the blade can be touched up. Well yes – but with typical use, not in your lifetime.

I like the visual appeal of this simple bulbous handle more that the fancier handle on my other tool, but the smaller girth of the Czeck Edge is a better fit for my small hands.

I do wish the Shenandoah had a ferrule connecting the steel and wood; time will tell how it holds up.

But bottom line: This is a nice tool to use, and a very nice tool at which to look. *— Megan Fitzpatrick*

Birdcage Awl

Shenandoah Tool Works ▪ shenandoahtoolworks.com

Street price ▪ $54.99

▪ VIDEO *See how the twisted shaft of this tool is made.*

Price correct at time of publication.

Jet JWBS-14SF-3 Band Saw

The new 14" steel-frame band saw from Jet is nothing less than heavy-duty. With its 3-horsepower, 220-volt motor, this saw is built to handle just about anything you can throw at it.

The one-piece frame makes this band saw extremely rigid for tough cuts such as resawing wide boards (it has a 13½" capacity). At 360 pounds, there's enough mass to absorb almost all of the vibration created by the moving parts.

Everything from the ample cast iron table to the rip fence body speaks to a machine that is built to endure. Plug it in, turn it on and you can motor through work for years to come.

There is very little assembly needed before you can put the saw to work. You have to put together the rip fence, clean the anti-rust material from the table and attach the rip fence guide bar – that's it. All told, I spent less than 15 minutes getting the machine ready.

Once up and running, it muscles through the hardest woods with ease. The rip fence and guides required minimal adjustment to use the included ½" blade. It sawed true from the first cut.

However, I find the locking handle for the lower blade guides beneath the table to be problematic when adjusting the table angle. If you don't swing the handle out of the way, you can only get the table tilted about 25°.

There's also a guide pointer on the upper housing that indicates the position of the upper blade guides relative to the table. When in place, it causes the front blade guard to seriously rub against the upper wheel. I removed it.

But these are minor issues. If you're looking for a seriously heavy-duty band saw at a reasonable price, the Jet JWBS-14SF-3 could be it. PWM

— Chuck Bender

Jet JWBS-14SF-3 Band Saw

Jet Tools ▪ jettools.com or 800-274-6848

Street price ▪ from $1,800

▪ BLOG *Read Glen D. Huey's take on the 14SF-3's little brother.*

Price correct at time of publication.

Not Just any Hat Will Do

Let function and proportion be your guide when designing a top.

Growing up, I was never one for wearing hats – that was until fresh out of high school when I headed west to work on a cattle ranch high in the mountains of Montana. My brother looked me over the first day and said, "Where's your hat?" He tossed me a baseball cap emblazoned with a red-and-white checkered Purina Feeds logo. "Tomorrow we go to town and you can pick up your own hat."

Ten hours of being perched on a tractor seat (under a blazing sun and thin mountain air) turned my pasty white Eastern skin lobster red. Needless to say, I was motivated to buy a proper hat the next day and looked at those wide-brimmed cowboy hats with new eyes (not to mention blistered ears).

The Proper Hat for a Cabinet

But what does a hat have to do with designing a top for a cabinet or table? Besides the obvious of topping off the design, it's always a mixture of beauty and function. From a functional standpoint, not just any hat will do (as my ball cap proved). A tabletop or cabinet top is meant to set things on and often needs to shoehorn next to an easy chair.

Early in the process, the overall dimensions of the project are established based on things such as a comfortable height to reach over to set down a mug or a favorite book. Usually at this stage, some general width and depth dimensions are worked up based on the space it must occupy.

My wife, Barb, often gives me her input, holding her hands spaced apart. It's not very scientific but she's usually spot-on. I say this to stress that the overall boundary dimensions are based on function and pleasing my favorite person in the whole world. That's the easy stuff.

A top with purpose. *This unfinished cabinet has minimal overhang to showcase the figured drawers below. The top employs an applied strip on its perimeter to bring it more in scale with the robust structure below.*

Trickier decisions involve such things as "How thick should the top be? How much should it overhang?" Because we are not resting engine blocks on our top, thickness and overhang are not a question of strength, rather they are a function of beauty. Is that top the right hat? Does it complement the overall design?

Tip of the top. *A hat, good or bad, is the first thing we notice. You can say the same thing about a top on a small table or chest.*

Points of View

Top thickness and overhang is a bit of a chicken-and-egg question, so it might be best to step back and consider a few things. On a low table meant to sit by a chair or a bed, a deep overhanging top will hide the structure below. That's neither good nor bad; it's just a function of our vantage point.

Avoid making design judgments on a low table while it's up on a workbench or sawhorses. This eye-level view can give a skewed impression. It's best when working with a mock-up or an actual project to make important

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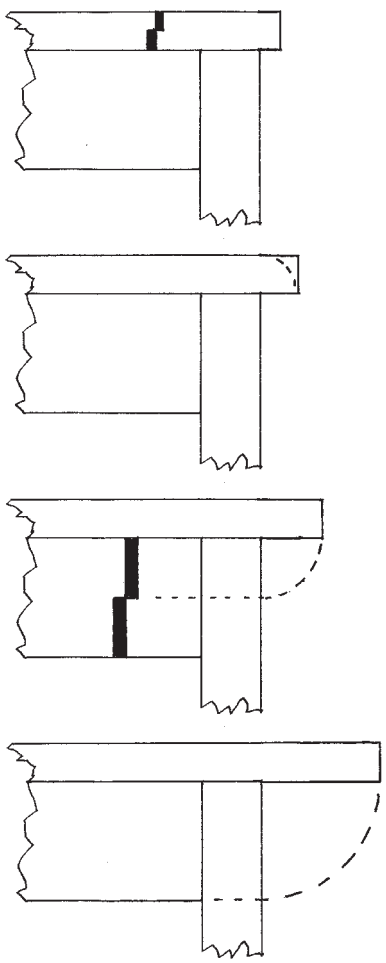
PHOTOS & ILLUSTRATIONS BY THE AUTHOR

CONTINUED FROM PAGE 20

aesthetic calls based on a normal viewpoint. Place the piece on the floor and view it from a standing, then a seated, vantage point. That said, we may not be concerned if the overhang hides the structure below, instead opting to emphasize some great figure in the top. It might be a great time to use that special wood you've been holding back. If we want the cabinet or table apron to show or want to give easy access to a drawer, we should steer toward a minimal overhang.

Regardless of which direction you go, the overhang will have a major impact on the character of the piece. Just think of all the people you've seen wearing awful hats.



Half-measures. *For a minimal overhang, extend a top by half its thickness. Bump it out in proportional increments from there. Which looks right to your eye?*

I like to judge the overhang by linking it proportionally to other elements close by in the design. I also like to pick an arbitrary starting point and bump it one way until it looks "too much," then in the opposite direction until it looks "too little." Somewhere in between is the sweet spot my eye is searching for.

I find it helpful to have some proportional increments to use when adjusting the top overhang. Let's start with the range of what we might consider. At a minimum, we might build a top that's flush with the structure below with zero overhang. From there we can extend our top out indefinitely, but it doesn't have to extend far until it starts to feel unbalanced. Starting with a flush top, I can bump it out slightly by extending the overhang equal to half the top thickness; my next bump is equal to a whole top thickness.

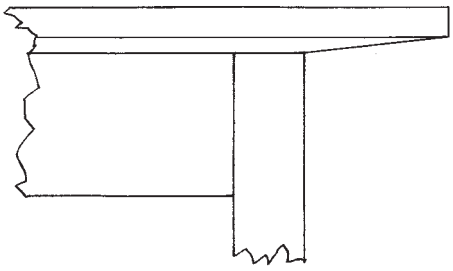
Those first few proportional bumps cover an overhang that is slight. If more overhang is called for, I pull a proportion from an adjacent element, such as a table apron directly below the top. Try extending the top by half the height of the apron. Or you could select half the height of the upper door rail on a cabinet. If you still need to push it further, try the full height of the apron or rail.

Using this approach does two things. First, it actually ties the overhang directly to something adjacent. Second, it forces you to take a focused look at the overhang in relation to nearby parts. If you make an effort to do this, very quickly you will find your eye doing this almost automatically.

Fine-tune the Thickness

Let's turn our attention to top thickness. This may have to bounce back and forth while determining overhang. Once we begin zeroing in on overhang, the top may appear too thick or thin. After we adjust the thickness we may feel we need to adjust the overhang again. Each iteration pulls us closer to the result we are seeking.

My general approach is to get in the ballpark by thinking about the overall



Edge relief. *A heavy-looking top is easily thinned by relieving the bottom edge with a chamfer.*

character as well as any adjoining structure near the top. Does this design have an overall delicate character calling for a thinner top, or is it robust with strong-looking architectural structure beneath it?

Also remember that a top can be made to appear more delicate by chamfering the underside of the edge.

Confidence Builder

You'll find that using this approach will help you quickly size an appropriate top to your next project. Along the way, you will also begin to internalize this way of thinking and train your eye to make judgments based on the overall design as well as smaller details within the design.

And don't forget your hat. **PWM**

George is the author of two design DVDs (Lie-Nielsen Toolworks) and co-author (with Jim Tolpin) of "By Hand & Eye" (Lost Art Press).

ONLINE EXTRAS

For links to all these online extras, go to:

- **popularwoodworking.com/dec14**

BLOG: *Read more from George R. Walker on his Design Matters blog.*

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About This Column

Design Matters

Design Matters dives into the basics of proportions, forms, contrast and composition to give you the skill to tackle furniture design challenges with confidence.

Green Woodworking

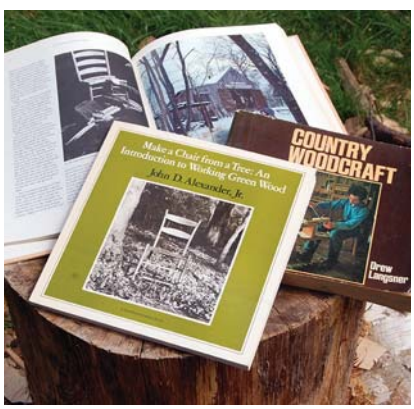
While the term is easily understood, it's not easily defined.

Back in the 1970s, there was an undercurrent in American woodworking that connected to an ancient past. After decades of home-workshop projects, many craftsmen were trying to understand some of the "old" ways of woodworking. One of these woodworkers was John (now Jennie) Alexander, a chairmaker from Baltimore.

Alexander was learning, principally through research and trial and error, how to make ladderback chairs from freshly felled hardwoods, particularly hickory and white oak. While Alexander was working away in an urban workshop, Drew Langsner was in his rural mountainside shop working on a book of projects called "Country Woodcraft." Somehow, these two got wind of each other and began a correspondence.

Alexander noted that Langsner's term "country woodcraft" excluded workers in cities and towns, so the phrase "green woodworking" was introduced. "Green" referred to the use of freshly felled stock as the starting point for such projects as the chairs in Alexander's book, and the spoons, bowls and agricultural implements included in Langsner's book.

Rebirth. *This is the chair that launched a thousand chairmakers – John (now Jennie) Alexander's iconic ladderback chair, featured in the 1978 book "Make a Chair from a Tree." It's lightweight, strong, attractive and comfortable; what more does a chair need to be?*



Seminal books. *Alexander's "Make a Chair from a Tree" (Taunton), Drew Langnser's "Country Woodcraft" (Rodale), and Roy Underhill's "The Woodwright's Shop" (UNC Press) led me to learn more about the craft of "green" woodworking.*

Roy Underhill's work, begun at the same time, bridged both these subjects and threw in house-framing, log building and more.

A later book by Langsner, "Green Woodworking" (Country Workshops), went ahead and embraced the term.

Today, there is a resurgence in this approach, culminating on the Internet in a number of green woodworking groups, forums and what have you. Some even get together in the physical world.

What Does 'Green' Mean?

For many woodworkers, if you ask them what kind of work they do, they might say, "I'm a green woodworker," and others will get it.

But what does that really mean? Some items clearly benefit from being made from green wood – spoons and bowls, for example. Furniture forms usually can't be made start-to-finish from green wood due to shrinkage and distortion.

It is a revelation to many that you can work wood this way to any extent. I think back to a time when woodworkers regularly combined the use of green wood (usually riven, or split, from the

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OPENING PHOTO BY GAVIN ASHWORTH; STEP PHOTOS BY THE AUTHOR

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Exemplar of green. *Green woodworking is perhaps best exemplified by Robin Wood's bowl turning. For more than 20 years (and more than 10,000 bowls), Wood has worked at rediscovering the lost techniques of turning bowls from green wood on a pole lathe. To me, this is the height of green woodworking.*

log) and drier, or seasoned wood, depending on the project at hand. I am forever grateful that my introduction to woodworking was through Alexander and Langsner. Splitting stock right from the log helps you learn things about wood that mill-sawn/lumberyard stock doesn't teach you – not as easily, anyway.

The joined furniture I make utilizes a range of materials with varying degrees of moisture content. A joined chest, for example, can be built entirely from riven green oak. Things like the panels, floorboards and lid, though, need to be roughed out from the green wood, then allowed to dry before they can be installed in the chest.

So what's the point? Why not just use dry wood in the first place? It can become a chicken-or-egg scenario: You use green wood because you're riving it, or you rive it because it's green wood. But in either case, the benefits are quite tangible.

Riving oak is best done radially, resulting in very stable quartered stock. This orientation also is the easiest surface with which to work – more cooperative than the typical flat-sawn tangential face we so often encounter.

The riven radial stock dries very evenly, with little distortion. Drying project parts is also quicker than drying full-length boards. So you can split out your stock, rough-shape it, then stack it and let it dry for a few weeks before proceeding to your final surfacing.

If all it takes to be a green woodworker is freshly felled trees, then aren't all woodworkers doing that? The sawmills slice up green logs, too, then either sticker and air-dry the boards, or send them through a kiln. Many woodworkers think that kiln-dried wood is another beast from air-dried. I am among them, and avoid it as much as possible. But if you use air-dried wood, isn't that the same as the green woodworker? You've just used a different method to convert the log into stock. So maybe green woodworkers are defined more by their log-conversion method than by the moisture content of their stock.

But wait – it gets worse. I know several woodworkers who use a band saw to slice riven stock into smaller components. The wood is sopping wet, but they have substituted the band saw's certainty for the froe's element of risk. Does this mean they are not green woodworkers?

In the end, it comes down to a matter of semantics. In the grand scheme of things, woodworkers throughout history, all over the treed world, have used wood in a range of forms with varying moisture content. It was probably a late-19th/early 20th-century Western/developed world concept that all your stock had to be flat, dry and square. Go to the woodpile, grab some likely candidate and delve into a world of woodworking that reaches across time and space to connect with a tradition for the ages. Trees are wood – we are woodworkers. **PWM**

Goldilocks. *People are often surprised to realize that a project like this wainscot chair can be done with green wood. The pieces are riven and planed while they are very green, or wet, but assembly comes a bit later, with stock that has dried to varying degrees. I always refer to it as the "Goldilocks Situation" – not too wet, not too dry, but just right.*

Split your own. *Riving green oak for joiner's work is the best route to high-quality boards. Radially-split, straight-grained stock is easy to work and very stable; it's the best oak there is.*

Peter is a teacher of traditional woodworking and host of several videos from Lie-Nielsen Toolworks. He has been involved in traditional craft since 1980.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/dec14**

BLOG: *Read Peter Follansbee's blog.*

TO BUY: *"17th Century New England Carving: Carving the S-Scroll" (Lie-Nielsen).*

About this Column

ARTS & Mysteries

"Arts & Mysteries" refers to the contract between an apprentice and master – the 18th-century master was contractually obligated to teach apprentices trade secrets of a given craft (and the apprentice was expected to preserve those "mysteries").

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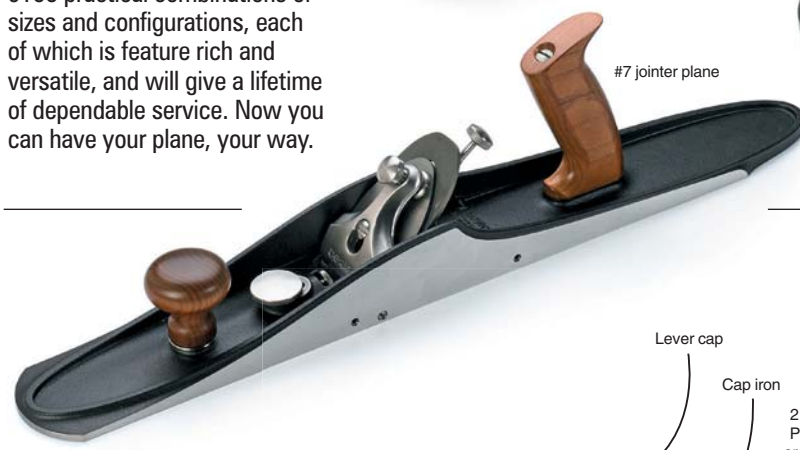

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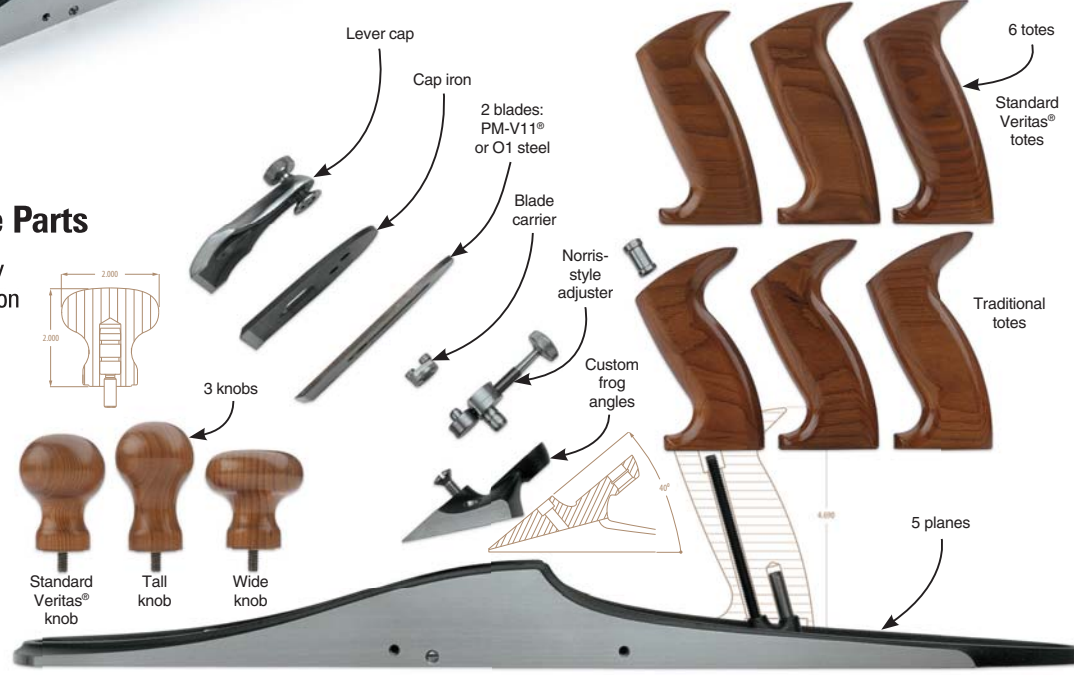

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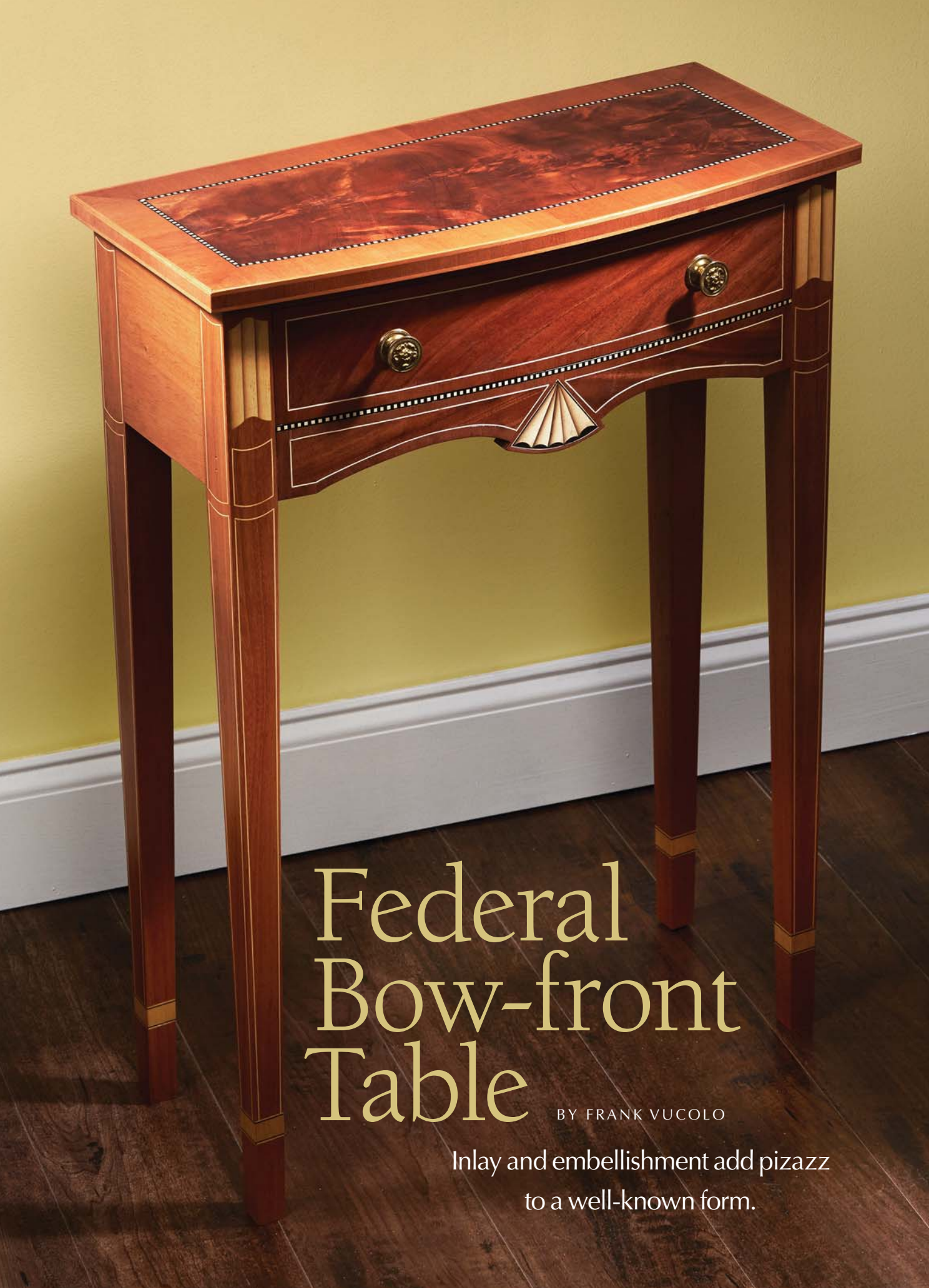


Federal Bow-front Table

BY FRANK VUCOLO

Inlay and embellishment add pizazz to a well-known form.

I designed this table using the materials, ideas and embellishments of the Federal period. It begins with an objective aesthetic: a small table with tapered legs. This form was a staple of the style, but it's found in neoclassical representations throughout the Western world, and was widely used in Shaker and French country tables.

I added a bowed front, exotic veneers, stringing, banding and inlay in the Federal fashion, then formed a shapely lower rail with a drop, into which I inlaid a quarter fan – another core element of Federal decoration.

Select & Prep Materials

Because this is a relatively small piece, I was able to pull all the solid mahogany from a single 8/4 board approximately 13" wide x 64" long. Thus I didn't need to use any stain, dye or atomized kryptonite to gain consistent coloration.

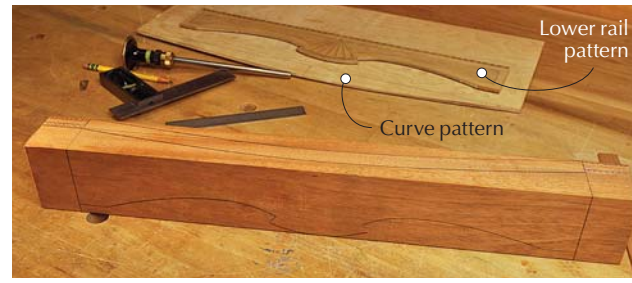
I used rift-sawn sections for the legs to ensure there was no cathedral grain to conflict with the inlay patterns. The flat-sawn sections do well for the aprons, rails and drawer front.

I used crotch and straight-grain mahogany veneer for the top, lower rail and drawer front. For the stringing, inlay and banding I used solid mahogany and mahogany veneer, as well as solid holly and holly veneer. Additionally, I used ebony for banding and fan inlay, satinwood for cuff banding, and black-dyed veneer for the black stringing.

Before getting started, make two patterns from the plans: one for the curve of the table (top, drawer front and lower rail), the other for the elevation of the lower rail. (I use 1/8" or 1/4" plywood or MDF; whatever is most handy.)

Taper the Legs

The two inside-facing sides of each leg are tapered; the two outside facing sides remain straight. Dimension your leg stock to 1 1/2" square and cut it to length. I taper the legs using a shop-made jig that rides in the miter slot of my table saw. The taper starts 6" from the top of the leg, narrowing to 7/8" at the foot. Any two adjacent sides can be tapered at this stage, leaving two adjacent sides straight.



Helpful guidance. *Make full-size patterns from the plans for precisely marking out the bow front's curve and the shapely lower rail.*

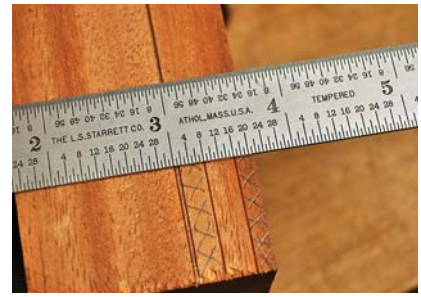
In selecting which sides to taper, consider which two adjacent straight sides will look best. Once all four legs are tapered, arrange them so the best surfaces face front. Let the less-fortunate faces live out their lives facing a wall. Mark the leg position boldly so as not to get confused in the mortising and assembly process.

Lay out and cut the mortises for the side and rear aprons and the lower rail. I am using 5/8" material for the aprons and start with 8/4 material for the lower rail; all are assembled flush to the outside face of the leg – no offset.

Set up for a 1/4" mortise located 1/4" from the front of the leg. This results in an offset tenon with a 1/4" shoulder on the front and 1/8"on the back. This ensures there is enough material left in the leg to support the joint. I used a hollow-chisel mortiser, but any technique will do.

Complete the Lower Rail

Scribe a line 5/8" from the back face along the top edge of the 8/4 lower rail, then lay out for tenons at each end. The tenons will be offset to leave a full 1/4" mortise wall on the front of the leg. Make sure to allow for the veneer when laying out the tenon.



Offset allowance. *Lay out 1/4"-thick tenons on the lower rail with a 1/8" rear shoulder and a 1/4" front shoulder – and consider your veneer thickness when laying out.*

Accurate taper. *A sliding jig for the table saw makes precise tapers. Cut two adjacent tapers on all four legs.*

In fact, allow a little extra. My veneer was 1/40" and I allowed 1/32" when laying out. Because the rail meets the leg flush and both pieces will be inlaid and/or veneered, there will be no chance to adjust the joint once the inlay work is done. By leaving the leg slightly proud of the rail, the leg can be planed down prior to adding the stringing and inlay.

Use your patterns to lay out the curve on the top of the rail and the elevation shape on the face.

I cut the tenon shoulders on the table saw, then made the cheek cuts on the

Shapely rail. *Use a band saw to rough-cut the profile of the lower rail.*

PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG FROM THE AUTHOR'S DRAWINGS

band saw. Leave the tenons full width for now; you will need them to register the curve cut on the band saw later.

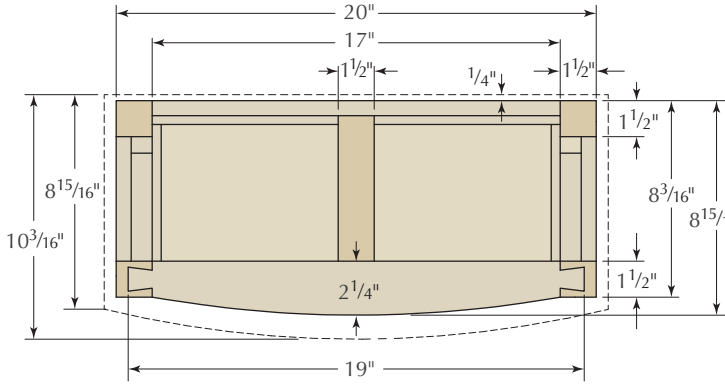
Now saw the shape on the face of the rail, but leave a flat on the bottom of the drop; you will need it to register the piece as you cut the curved front.

To saw the curve, you may need to extend the size of your band saw table (I use a piece of MDF clamped in place). You need at least two points (a tenon and the flat on the drop) to remain in contact with the table at all times while you cut the bow on both faces. After cutting them, use an oscillating spindle sander to remove the saw marks and fair to the lines.

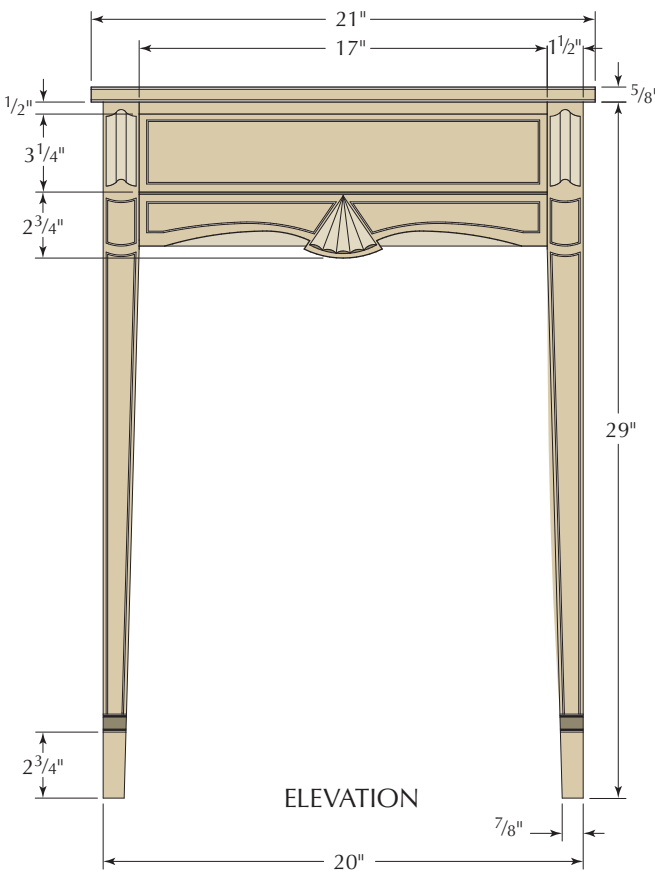
With the faces smooth, use the template to reestablish the profile on the face, and a compass to reestablish the drop for the fan. This ensures that the fan location is centered and symmetric, regardless of any slight irregularities from the sawing and sanding process. Now cut the sympathetic curve on the inside face of the apron.

Ample support. *An auxiliary table attached to the band saw supports the flat at the center and both ends as you cut the curve on the front and back of the lower rail.*

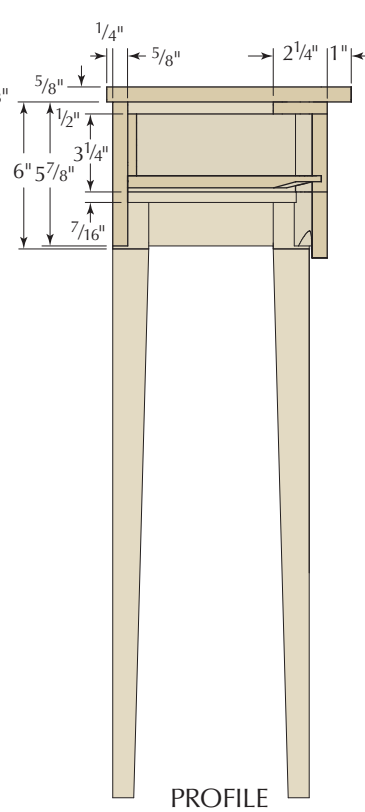
Refine the rail. *After roughing out the rail, refine the curves and use a compass to center the drop for the fan.*



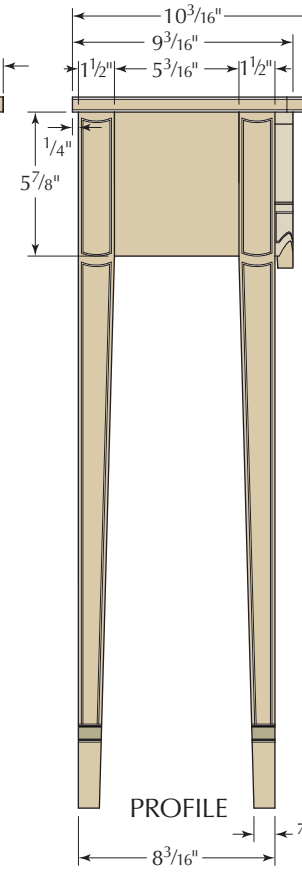
PLAN



ELEVATION



PROFILE SECTION



PROFILE

In pencil, lay out the veneer and inlay pattern on the rail. I use a compass to scribe the curved sections. Be sure to mark in the thickness of the stringing that outlines the field and the fan.

Trace half the shape of the crotch veneer fields from the piece, and transfer it to cardboard to use as a pattern as you cut the pieces of veneer for the right and left sides (do half, then flip the pattern for the other). Leave the veneer long left and right, but cut it to the line top and bottom.

Hammer veneer the field sections to the rail, allowing the left and right ends to overlap the outline, but keep the top of the veneer true to the layout line. After the glue cools for about 10 minutes, use a straightedge and knife to cut the ends to the layout lines and peel away the waste.

Apply the stringing around the field. I miter the corners for a good fit as I go, and glue the stringing in place with white glue from a syringe. Hold the stringing in place with pins.

Excess field. *A painter's 5-in-1 tool makes quick work of removing excess materials from the field after you've cut to the layout lines.*

Pinned in place. *After the crotch mahogany field is set, apply stringing, mitering the corners and holding the holly tight to the field and down to the rail with pins.*

Now you're ready to place and affix the fan. (Note: Make your own sand-shaded inlays or buy it ready-made; see the Supplies box on page 32 for resources.) I prepare by cutting a piece of cork just larger than the fan and cover the cork with clear packing tape. A piece of the offcut from the front of the rail makes a perfect curved caul. After applying glue, secure the fan in place with 23-gauge pins (I break them off a strip of pin nailer pins) and tack them in place by hand with a hammer. Place the pins in shaded areas.

Use the cork pad and caul to clamp the fan to the rail. When the glue is dry, surround the fan with black and white stringing so the black edge outlines the fan.

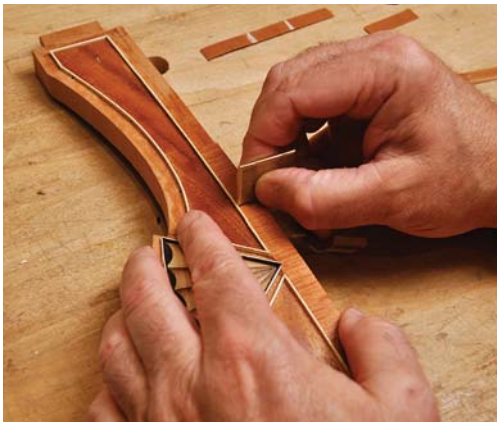
Prepare strips of straight-grain mahogany veneer for the crossbanding. Each side of a leaf of commercial veneer will reflect light differently, so it is important that each strip is placed face up. I use chalk marks to register the face and the left-to-right orientation.

The veneer is hammered using hot hide glue. Because a veneer hammer would be too clumsy on the crossbanding, I use a piece of 1/8" brass bar stock rounded over on all four edges as a "finger hammer." Start with the straight piece on the top and work your way around the crotch veneer field and the fan. To cut the crossbanding to fit the curved sections, place a sheet of plain paper on the apron and trace the curve of the stringing with the side of a pencil. Cut the paper and use it as a template to transfer the curve to the veneer.

To inlay the black-and-white banding, let the glue set up for a few minutes, then score a line the width of the banding using a marking gauge. Cut all the way through with a scalpel, then remove the waste. (If you don't care to make your own banding, see the Supplies box for a source to purchase it and other materials.)

Use liquid hide glue to apply the banding, and use plenty of tape to hold it in place. After carefully trimming the overhanging veneer, I bring the banding, stringing and inlay flush to the surface using a chisel, a small block plane and, finally, a scraper.

In the black. *Use 23-gauge pins, driven in the shaded areas of the fan, to hold it in place under the pressure of a clamped caul.*



Tight quarters. *A traditional veneer hammer is too large and clumsy to use on the crossbanding; I made a "finger hammer" from a piece of brass bar stock.*

Flushed face*. After leveling the stringing, banding, inlay and veneer with a chisel and small plane, scrape it flush with a small card scraper.*

"A well-adjusted person is one who makes the same mistake twice without getting nervous."

—Alexander Hamilton (1757-1804), American statesman

Dry-assemble

The assembly of this table is straightforward. The aprons and the lower rail are connected to the legs with mortise-and-tenon joinery. The upper rail uses a traditional lap dovetail.

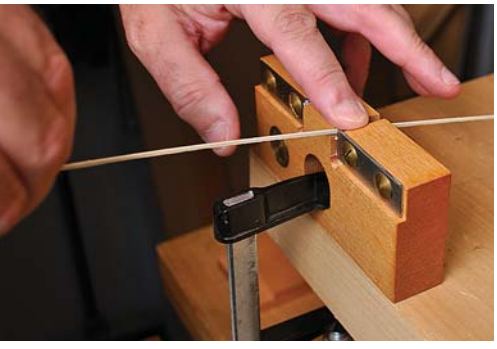
Dry-fit the leg to the lower rail. If your layout was good, the leg should be just proud of the rail. Carefully plane the leg, a pass at a time, until it is flush with the lower rail. If you missed, and your rail is proud of the leg, plane the back tenon cheek until you get a flush alignment, then build up the front face of the tenon by gluing on a piece of veneer.

Use the lower rail to lay out the shoulders of the upper rail and the shoulders of the rear apron. If you do this – and ensure that your side aprons are identical – you will end up with a square glue-up. And that is the key to a well-fit drawer later on.

The lower rail is also used as a template for marking the curve in the upper rail.

Cut the tails on the ends of the upper rail and use those to lay out the dovetail sockets in the top of the front legs. Cut the tenons on your back and side aprons and fashion a kicker, with shallow mortise-and-tenon joints, to span from the upper rail to the rear apron. Dry-fit the assembly.

When you love the way the lower rail meets the legs, it's time to take the dry-fit apart and start inlaying the legs.



Sized up. *A radius cutter, set to 1¼"r, cuts the curved grooves for the stringing. The stringing is prepared slightly oversized for a 1/32" groove, then brought to final thickness with a thickness gauge.*

Inlay the Legs

Now lay out and pencil in the position of the stringing, inlay and banding on one leg. Once you're satisfied, make a story stick and use it to lay out the remaining legs. (Because the side of the leg is different than the face, I use one side of the story stick to mark the face, then flip it to mark the side.)

I like to start by cutting in the recess for the cuff banding. Mind the taper; flip the square as you work your way around the leg to ensure you are referencing a straight and not a tapered side. Using a sharp marking knife, cut in all the borders, then excavate the recess with a small router plane.

To excavate for the holly stringing, I use a 1/32" end mill in a small router with a stock fence. I start the router with the bit in the cuff-banding excavation and run it up to my line. A flex-shaft LED light, strapped to the tool with Velcro, helps me see the stop mark.

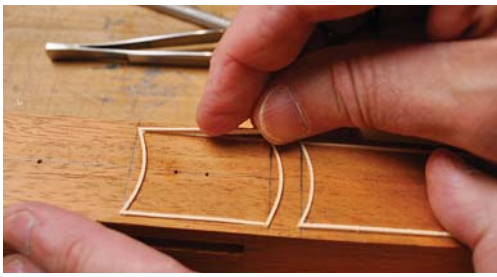
To excavate for the curved string sections, I use a radius cutter set up for a 1¼" radius. The stringing itself is cut slightly oversized. To prepare it, I use a thicknessing gauge to bevel both sides.

I start by inserting a small curved section of stringing, then miter both ends and aim for a tight fit into each corner. Next, I cut a corresponding miter on a straight section and press it tightly into the corner, testing the fit. Let the straight section run long into the cuff excavation. The extra length allows for recutting the miter as needed for a perfect fit.

After all the pieces are cut and dry-fit, use a syringe to put yellow glue into the grooves, then insert in the stringing. Once the glue is dry, plane then scrape the stringing flush to the leg.

To set the satinwood and black-dyed cuff banding, I place the rear piece flush on the back of the leg. The face and both sides are then mitered, hinged with tape and wrapped around the leg. The front corners are mitered, the rear corners are butt jointed.

I cut the sections oversized using a razor saw and a small miter box, then miter them using a bench sander with the miter gauge set to 45°.



Order of operation. *Miter and set the curved sections of stringing first, then fit in the straight pieces.*

Skip the saw. *Small pieces of banding are quickly and accurately mitered on a small belt sander with a miter gauge.*

SUPPLIES

Ball and Ball
ballandball-us.com or 610-363-7330

2 ▪ Sheraton brass pulls
#F-23-059

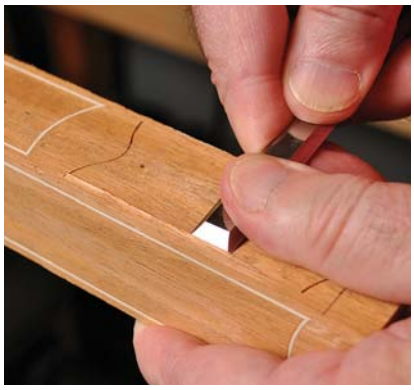
Berkshire Veneer
berkshireveneer.com or 877-836-3379

4 sq. ft. ▪ Crotch mahogany
3 sq. ft. ▪ Straight mahogany
3 sq. ft. ▪ Holly (strings, fan & bookend inlay)
2 sq. ft. ▪ Black-dyed veneer (strings)
1 sq. ft. ▪ Satinwood (cuffbanding)

Freddy Roman
periodcraftsmen@gmail.com

Note: Freddy Roman can supply fan and bookend inlay, stringing, black and white banding and cuff banding, should you wish to purchase it instead of making your own.

Contact for pricing.



Pare to the lines. *Before excavating for the inlay, carefully pare to the lines with a chisel on the straight sides and a gouge on the curves.*

Using liquid hide glue, adhere the cuff banding in place and clamp it with two spring clamps. Once the glue is dry, plane and scrape everything flush to the leg. Once flush, the butt joints are invisible from the front and side and all but invisible from the rear.

To insert the holly bookend inlay (refer to "Bookend Inlay" in the previous issue, or buy it ready-made) at the top of the legs, begin by taping it in place. Using the same carving gouge as was used to create the inlay (or that matches the curve on your purchased inlay), begin scoring the outline. (Mind the bevel to create a score perpendicular to the face of the leg.)

Once all the curved areas are scored with the gouge, use a scalpel to score the straight lines. Slice right through the tape. Re-tape the first side then cut the other side.

With the inlay still hinged with tape, flip it to check that everything is well-scored. Deepen the cuts freehand, then use a chisel to make shallow paring cuts into the lines.

Use a small router plane to remove the remaining waste. Make several passes and set the plane to remove enough meat to leave the inlay just proud of the surface. Test the fit.

Once satisfied, use liquid hide glue to adhere the inlay. Place a sheet of cork, covered with packing tape, between the inlay and the caul before clamping it in place. After the glue sets, use a card scraper to scrape the inlay flush.

With the legs complete, glue up the table and start work on the drawer.

Federal Bow-front Table

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑ 4	Legs	1 1/2	1 1/2	29	Mahogany	
❑ 1	Lower rail	2	2 3/4	19 3/8	Mahogany	TBE*
❑ 1	Rear apron	5/8	5 7/8	19 3/8	Mahogany	TBE
❑ 2	Side aprons	5/8	5 7/8	7 9/16	Mahogany	TBE**
❑ 1	Top rail	1/2	2 1/4	19	Mahogany	1" dovetail both ends
❑ 1	Kicker	1/2	1 1/2	6 9/16	Mahogany	TBE
❑ 1	Drawer front	2	3 1/4	17	Mahogany	thickness in the rough
❑ 2	Drawer sides	5/16	3 1/4	7 3/4	Poplar	
❑ 1	Drawer back	5/16	2 9/16	17	Poplar	
❑ 1	Drawer bottom	1/2	7 7/8	16 5/8	Poplar	
❑ 2	Drawer runners	7/16	1 7/16	7	Poplar	
❑ 2	Drawer guides	9/16	1	4 1/2	Poplar	
❑ 1	Top	5/8	10 3/16	21	Plywood	
BANDING						
❑ 1	Banding†	1/8	1 1/2	10	Holly	
❑ 1	Banding†	1/8	1 1/2	10	Ebony	
❑ 3	Top edge-banding	1/8	5/8	24	Mahogany	

*TBE = tenon both ends; **1" front tenon, 1 1/4" rear tenon;
†To make the black & white banding

Cut the Drawer's Curve

To begin this drawer, cut the blank for the front from 8/4 stock so that it fits snug in the opening. Using your curved template, mark the radius from corner to corner on the inside of the drawer front. Next, pencil in a temporary outside radius on the drawer front, 7/8" from the inside mark. Cut the inside curve on the band saw, then sand it smooth and to the line.

Because the drawer sides are only 5/16" thick, the shallow curve of the inside of the drawer front can be represented on the sides as an angle. Find that angle using an adjustable square, then transfer it to the drawer side.

Now mark the baseline on the outside of the drawer sides, then mark the angle across the top and bottom edges. Strike the baseline for the inside of the drawer sides off the angle mark.

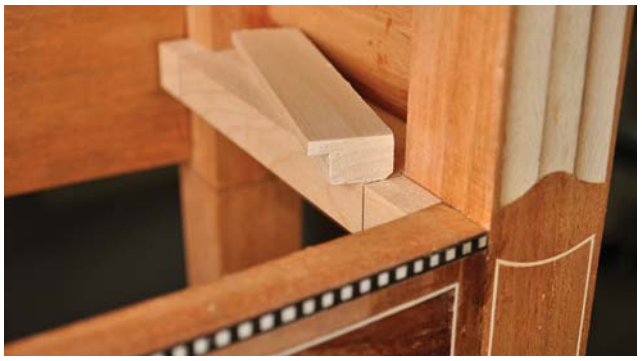
Lay out and mark the tails in the traditional fashion. After carefully sawing to the shallower baseline, lower the heel of the saw and finish into the deeper baseline.

To remove the waste between tails, use a carefully angled fret saw to get close to the baselines. A sharp chisel is

Angled drawer sides. *Mark the taper on the drawer side ends to cope the curved inside of the drawer front.*

Set the fence. *Use the routed groove on the drawer front to set your plow plane for the grooves on the sides.*

Perfect fit. *After fitting the drawer, trace the final curve of the front from the top rail and cut it on the band saw.*



Sneak up on the fit. *Rabbeted guides can be tweaked with a small block plane after being glued in place. Cut them tight, then plane a shaving at a time until the drawer fits perfectly.*

used to pare between the lines, resulting in the desired angle. Cut the pins on the drawer front in the traditional fashion and test the fit.

To make the groove in the drawer front, use a 1/8" slot cutter and a router. Lay it out so that the groove ends in a tail socket.

Use that groove to set the cut on your plow plane. A few passes takes care of the grooves in the drawer sides.

The rear of the drawer is constructed with through-dovetails in the usual fashion. With that complete, glue up the drawer.

Make the drawer bottom (which is curved at the front to match the drawer's curve) from 1/2"-thick poplar. After using a marking gauge to mark a line 1/8" from the face and another line 1 1/4" from the edge on both sides and the front, I use bench planes to plane to those lines to create a bevel.

Fit the drawer bottom, but because you need to remove it to veneer the drawer front, use #4 3/4"-long steel screws both to temporarily hold it in place and to cut the threads. (Replace them with #4 brass screws once the face is veneered.)

Extend the temporary pencil line that represents the face of the drawer front to the sides of the assembled drawer. Fit the drawer to the opening so that both side lines are flush with the legs. Now mark the final curve of the drawer front by tracing it off the upper rail. Make the cut on the band saw, then use a small block plane to smooth the surface and bring it to the line.

The veneer work on the drawer front is similar to that of the lower rail, but without all the undulation. Start by hammer veneering crotch mahogany for the field, then trim it to size.

After scoring a line for the straight-grain mahogany edge banding with a marking gauge, finish the cut with a knife and remove the waste before the glue cures.

Stringing is applied in the same way as on the lower rail. Apply the crossbanding and, as before, pay attention to its orientation.

Now glue runners and guides to the aprons. The guides are sized short and rabbeted so they can be easily planed when fitting the drawer. I leave it about 1/16" proud, then shave it for a nice fit.

Top it Off

I used 5/8" Baltic birch plywood as a substrate for the top. Use your curved template to lay out the top, then cut it to size. Next, lay out the placement of the crotch mahogany veneer that will make up the field, and extend the layout lines beyond the field.

Hammer the field into place. Using a straightedge and the curved template, and referencing off the extended marks, trim the field and remove the waste.

Cut some straight-grain veneer crossbanding, marking the show side and direction with chalk. The curved sections are cut using the template as a guide. Begin hammering the crossbanding into place. To piece together the length on the front and back, I overlap two pieces, cut through them, remove the waste, then re-glue and hammer the seam.

To miter the crossbanding at the corners, use a straightedge and a scalpel to make a cut from the corner of the crotch field to the outer corner of the tabletop. Before you do this, however, trim the overhanging veneer to the edge of the top. This will both help you to

Invisible seam. *Overlap the mahogany crossbanding sections, cut through both, peel and remove the waste, then re-glue and re-hammer for a gap-free joint.*

Don't measure. *Don't even try to measure the miters. Cut them with a knife against a straightedge from the corner of the veneer to the corner of the top.*

see the corner and avoid blowing out the fragile short-grain veneer at the outer point.

To make the corresponding miter cut on the side piece, measure the angle of the corner-to-corner piece you just cut with a protractor and transfer it to the second piece to make that cut.

Continue this process and work your way around the top. The joint between the field and the mahogany crossbanding need not be perfect because that seam will be excavated to put in the black and white banding.

The groove for that banding is cut with a router. To ensure a tight fit, use a straight bit that is smaller than the inlay and do it in two passes. Make a sample cut on a piece of scrap then make the first pass. Adjust the fence on the router, make another test cut, then make the second pass.

My router has a split fence allowing two-point contact on the curved section. If your router fence is continuous, you will have to make an auxiliary two-point fence for the curved section.

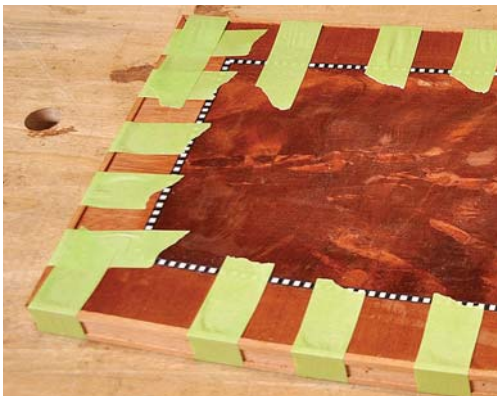
The router leaves rounded corners, so trim them up with a chisel. Then lay out the banding and position it for the most pleasing miter cuts. Once satisfied with the fit, use hot hide glue and a roller to set the banding in place.

The tabletop gives the appearance of 1/8" solid wood inlays at the top and bottom edges (called "perflings" by luthiers). The edge is actually made from one solid banding with a groove down the center for the veneer.

Cut the groove – just slightly deeper than the veneer is thick – at the router table. Apply the edge pieces with liquid hide glue and tack them in place with a pin nailer for position. To ensure a tight seam at the table edge use several pieces of tape, pulled taut. When the glue dries, plane and scrape the bandings – edge and inlay – flush.

Cut strips of straight-grain mahogany veneer to fit snugly into the groove. Using hot hide glue, hammer it into the groove with the grain oriented vertically. Let the glue dry overnight then plane the edge until you bring the solid wood and the veneer flush.

Two passes. *After routing a narrow groove between the field and the crossbanding on the top, reset the fence for a second pass the exact thickness of the banding for a snug fit.*



Pin it & tape it. *Once I was happy with the miters, I used liquid hide glue to fasten the grooved edge banding. I pinned it in the groove to position it, then used a liberal amount of tape to pull it tightly in place.*

Sharpen first. *After the glue holding the vertical mahogany veneer in the groove has cured overnight, sharpen your plane iron and flush the solid banding to the veneer.*

Finish it Up

There are a lot of good approaches for finishing mahogany furniture that is inlaid. Most of them fall along the lines of making the mahogany look as rich as possible and the inlay as bright as possible. The word "pop" comes up often.

But I used no dyes, stains or chemical treatments on the mahogany and did nothing to preserve the brightness of the inlays. In fact, I tried to soften the contrast and blend the mahogany with its decorative detail into one harmonious piece. I used only shellac and wax.

Start with two coats of garnet shellac. That gives a little richness to the mahogany and softens the contrast of the holly and satinwood. Build up many coats of blond shellac over a week or so, leveling after every three or four coats until the finish looks the way you want. After the last coats cure, rub the piece out and apply a coat of dark mahogany-tinted wax followed by two coats of a clear satin finishing wax.

In period work it is common to use the term "inspired" when not making a strict reproduction. I think that if we design strictly inside the period vernacular, we are creating a period piece. I like to think a maker in 1790, working with a client, might have conceived this piece. **PWM**

Frank, who's been a woodworker for more than 25 years, lives in East Amwell, N.J.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/dec14**

ARTICLE: *Learn more about furniture from the Federal period.*

ARTICLE: *Learn how to make diamond banding in a free article from Rob Millard.*

TO BUY: *Discover the steps to sand shade and assemble Federal bookend inlay in the previous issue – November 2014 (#214).*

IN OUR STORE: *"Make an Inlaid Gallery Table."*

Our products are available online at:

- **ShopWoodworking.com**

Saw Sharpening 101

A well-tuned tool pays great dividends when the blade hits the board.

BY MATT CIANCI

We've all been there: You reach for your saw in the middle of a project, and before you start the cut, you drag your finger along the teeth and say to yourself, "Meh... they're sharp enough." But you soon find out they are anything but.

Wouldn't it be nice if you could sharpen your own saws and never have to settle for the misery of a dull saw again? With a small investment of time and money, you can.

So let's jump right into the four critical steps to sharpening any handsaw: setting, jointing, filing and stoning.

Setting

A saw's set – the right and left projection of the teeth from the saw plate – determines the width of the kerf and prevents the saw from binding in the cut.

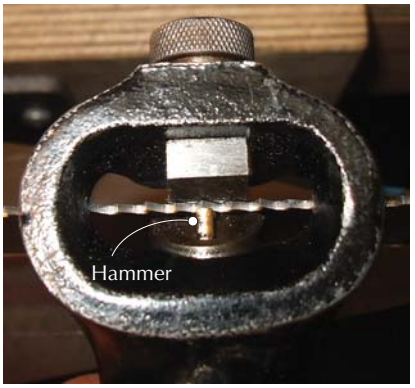
Setting the teeth might not always be needed, so the first step is to evaluate.

To test your saw's set, make a cut in a piece of wood whose species, thickness and moisture content is typical of your work. If the saw binds (gets stuck in the cut), it requires setting. If the blade is loose in the kerf, however, then it may be over-set, which can be corrected in the final step of stoning.

Most saw set tools adjust to allow setting different sizes of teeth and types of work. I recommend adjusting your tool to create the slightest amount of set for a backsaw, and only a touch more for a handsaw. Ignore the numbers on the tool; they are there only to confuse you.

If your saw requires setting, begin by clamping the saw in a vise with the toothline about 2" above the jaws. Starting at the heel of the saw, identify the first tooth set away from you. Place the saw set so the center of the hammer (the steel mechanism that bends the tooth over the anvil) aligns with the point of the tooth. Make sure the casting rests solidly on the toothline and squeeze the tool firmly. You will see the tooth bend ever so slightly away from you. Skip the next tooth and move on to the next tooth set away from you. Set it as

Rip teeth vs. crosscut teeth. *Rip teeth (left) are shaped like tiny chisels and are shaped and sharpened by filing square across the blade. Crosscut teeth are shaped more like knives and are formed by filing at an angle to the blade.*



Set. *Slip the saw set over the saw blade, rest it firmly on the toothline, align the hammer with a sawtooth, then squeeze.*

LEAD PHOTO BY RIC DELIANTONI; STEP PHOTOS BY THE AUTHOR

you did before, and repeat down the entire length of the saw. Now flip the saw around in the vise and set the teeth you skipped on the first pass.

Jointing

Jointing a saw every time you sharpen it ensures that the teeth are all the same height. It also creates a flat facet at the very point of each tooth that will guide your work in the filing step.

To begin jointing, keep the saw firmly in the vise with about 2" of the blade above the jaws. Grasp the mill file with both hands and rest it on the toothline at the heel. Run the file down the toothline toward the toe of the saw, using moderate pressure, until you see a flat facet on the point of each tooth. Two to four passes of the file should be sufficient for most saws.

It is critical that you keep the file perpendicular to the side of the saw blade as you joint the teeth. You can use a card scraper jointing guide or a block of wood to aid in this process.

Before you move on to filing the teeth, attach a rake-angle guide to the tip of the file to create consistent geometry on the cutting face of each tooth. Most rip-filed saws have a tooth rake of 5° to 10°, and most crosscuts have 15°.

A rake guide is a small block of wood, or a commercially made affair with moving parts, knurling and scales galore, that slips over the tip of the file to create a visual reference for the rake angle as you file. If you make your own, you'll need several for each size of file and rake angle you typically use.

Joint. *A file (held here in a shop-made saw jointing guide) levels the teeth to one another and creates a flat top on each. (You can purchase a similar jointing guide; search for "card scraper jointing guide" online.)*

Rip Saw Filing

The goal in this step is to file each tooth until the flat created by jointing disappears – and not a stroke more. The moment the flat disappears is the moment that the tooth is sharp and remains exactly the same height as the rest of the teeth. (Were you to continue filing, the tooth would stay sharp, but get shorter than the others, rendering it useless.)

Clamp the saw in the vise with the heel on your right and the bottom of the gullets $^{1}/_{16}$" above the jaws. Place the saw file in the first gullet. Ensure the file is seated fully in the bottom of the gullet. Hold the file perpendicular to the side of the saw blade (level with the floor) and to the toothline as viewed from above. Use the full length of the file and push it across the saw with gentle pressure.

Beginning filers have a tendency to use short, heavy, chattering strokes. Light, full, even strokes are the mark of an accomplished and precise saw filer. When you push the file across the saw you should see bright, fresh steel exposed on three surfaces: the

SAW FILING TOOLS

Taper saw files (with handle): Match the tooth spacing of your saw to the proper-size file. Always use the properly sized handle.

- 12-15 ppi: 4" or 5" double extra slim taper (xx-slim)
- 10-11 ppi: 6" double extra slim taper (xx-slim)
- 9 ppi: 6" extra slim taper (x-slim)
- 8 ppi: 6" slim taper
- 5-7 ppi: 7" slim taper
- 3.5-4.5 ppi: 7" regular taper

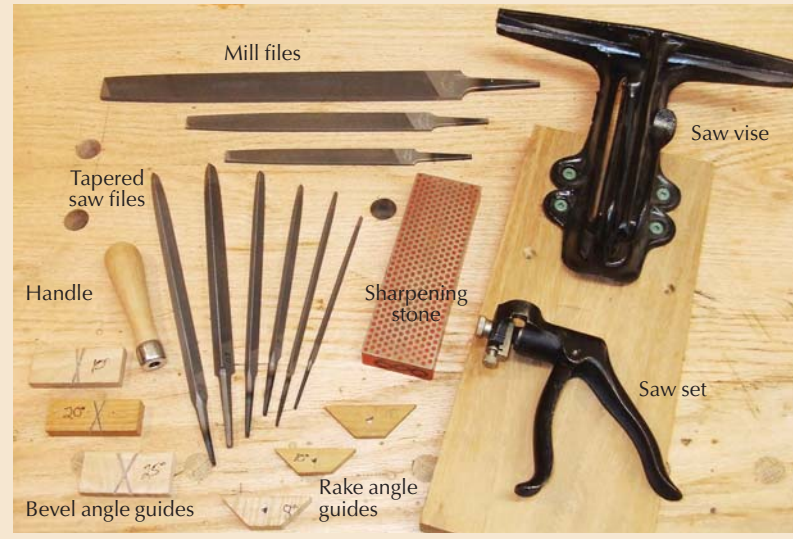
Mill file: bastard cut, 6" to 8" for backsaws, 10" to 12" for handsaws.

Saw set: any brand or style, though there are no quality new saw sets made today.

Saw vise: Shop-made of wood for the thrifty, Gramercy Saw Vise for the demanding, or vintage cast iron for the nostalgic. I file for two to four hours every day and there is no equal to my Gramercy.

Sharpening stone: 6" x 2" #600-grit diamond stone or fine India stone for handsaws, 1" x 4" stone for backsaws.

Saw filing guide: I prefer shop-made wooden guides for rake and bevel angles because they are free when made from scraps, light and endlessly customizable. That said, the new guides available from Blackburn Tools or Veritas are very helpful to students. — MC



Rip-tooth geometry. *A ripsaw is filed to form a row of tiny scrapers. The moment the flat formed by jointing is filed away, the saw is sharp.*

Watch the angle. *The angle at which you push the file across the teeth affects the saw's cutting geometry.*

cutting face of the tooth to the right of the file, the gullet and the back face of the tooth on the left of the file.

Continue filing across the tooth while watching the flat on the right of the file. Stop filing the precise moment that the flat on the right of the file disappears. Move to the next gullet and continue the same process down the entire length of the saw on every tooth.

Crosscut Saw Filing

After jointing the saw, reclamp it, again with the bottom of the gullets about 1/16" above the vise jaws, and place the saw file in between the first pair of teeth at the heel, with a tooth set toward you on the right of the file and a tooth set away from you to the left. This may be either the first or second gullet on the toothline.

With the file resting in the gullet and using your index finger on the file where it rests on the saw, press the file firmly down into the gullet. The file should rotate away from a perpendicular line from the saw as viewed from above, usually 15° to 25° for most crosscut saws. This is the bevel angle of the teeth. Filing at this angle creates the knife edge that allows the saw teeth to cut across the grain of wood fibers.

Take your first stroke with the file fully seated in gullet while carefully maintaining the bevel angle, and watch the flat on both teeth to the right and the left of the file. The goal is to file until you have simultaneously reduced the width of the flat on both teeth by half.

Skip the next gullet and move to the following gullet with a tooth set toward you on the right of the file. Now repeat the process of filing while maintaining the bevel angle and watching both teeth on either side of the file. Reduce the flats on both teeth by half and stop. Skip the next gullet and repeat as you make your way down the saw.

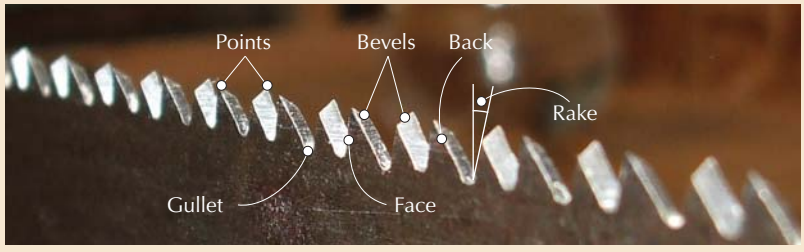
As you progress, notice the pattern of every pair of teeth filed in one direction with every other gullet not yet filed.

Once you have filed each pair of teeth in one direction down the length of the saw, return to the heel.

Now you'll remove the flats left from the previous step to bring all the teeth to a sharp edge. Place the file in the first gullet at the heel you skipped earlier. The tooth set away from you should be on the left of the file and the tooth set toward you should be on the right.

As before, press the file down into the gullet and notice how the file's angle rotates to away from perpendicular – but in the opposite direction as before.

TERMINOLOGY



There is much confusion around terms associated with saw filing. It is important to use standardized and accurate language when teaching or learning a new skill, especially one as ancient as saw filing. These are the historically accurate and best terms to use.

Spacing: The American standard measure of tooth points per inch (ppi) on any saw that determines its coarseness or fineness. (The English standard uses teeth per inch (tpi), which is equal to points per inch minus one. So 6 ppi equals 5 tpi.) Tooth spacing is often incorrectly referred to as "pitch" by modern saw manufacturers.

Rake: The amount that the front cutting face of a saw tooth leans back from perpendicular relative to the toothline. Measured in degrees from the perpendicular. Also traditionally referred to as "pitch."

Bevel: The interior acute angle on the face and point of a saw tooth that creates a cutting edge for cross-grain cuts. Also commonly referred to as "fleam."

Gullet: The V-shaped space between two neighboring saw teeth where the sawdust collects in use. — MC

"The expectations of life depend on diligence; the mechanic that would perfect his work must first sharpen his tools."

—Confucius (551-479 B.C.)
Chinese philosopher

ON DOING IT 'WRONG'

There are warnings in classic saw filing texts about sharpening entirely from one side. While I am usually deferent to wisdom of the past, I deviate from it here. Why? I honestly don't recall; it's simply the way I learned to file a saw. Many others today also file all from one side. You should be aware of this debate if you plan on sharpening your own saws. Here are the major objections:

1) Filing from one side of the saw dulls the file faster because you have to file into the teeth leaning toward you, which causes more wear on the file teeth.

The gullet edge of the file is what wears out first and destroys a file. I find the extra wear to the face edges rather irrelevant; they stay intact long after the file is useless, regardless of how you file teeth.

2) Filing from one side of a saw alone puts all of the filing burrs on the opposite side of the saw teeth and will cause the cut to steer to that side when the saw is used.

I have filed hundreds of saws. The only case in which I've found the above to be true is in dovetail saws and similar saws spaced 14 ppi or finer. The fine teeth can be affected by the burr, but an extra stoning pass or two on the burr side of the teeth is a simple remedy. On saws with teeth coarser than 14 ppi, I've found they are large enough to overcome any problems a burr might create.

3) You cannot create saw teeth with independently shaped back bevels (sloped gullets) by filing from one side of the saw.

I would say this is mostly true. But for 95 percent of woodworkers, I don't think independent back bevels on the teeth make a difference. For most work, the benefit is negligible. Can you gain a small advantage in your work with independently shaped back bevels? Sure. But to me, it's like the difference between a Corvette and a Ferrari.

So with all of these objections, you may be wondering why don't I just flip the saw, file from either side and avoid the controversy? For that matter, why do some people cut the pins of their dovetails first? Or use sandpaper after smoothing with a handplane? Or do any of the seemingly strange things that any of us do a million times a day?

Like most things in life, I simply have no idea. But I do know my method works.

— MC

This angle should be the same relative angle from perpendicular as before, (15°-25°). This final angle filed into each tooth will create the second and complementary interior bevel and complete the crosscut geometry.

As before, while maintaining a consistent bevel angle, push the file through the gullet and watch both flats on either side of the file. Keep the file seated in the gullet and ensure that you are removing metal from the face of each tooth in addition to the gullet. Ideally, you want each flat to disappear at the same moment. This ensures that each tooth is sharp and of equal height.

Continue to the next unfiled gullet and repeat filing each pair of teeth until you complete the saw.

Crosscut tooth geometry. *Jointing crosscut saw teeth creates triangular flats at the point of each tooth. These reflect light and help guide the sharpening process.*

Stoning

The final step in sharpening a saw is to stone it. Place the tool flat on your bench with the handle overhanging the edge. With a fine India stone or #600-grit diamond stone, use light pressure as you run the stone along the teeth down the length of the saw to even the set and remove the burrs created by filing. Flip the saw over and repeat. One pass per side is sufficient. (If the saw was overset to begin with, take more strokes as required.) No more than four strokes per side is recommended. (This step is also known as "side jointing.")

You may find that in a test cut after sharpening a fine rip-filed saw (14 ppi and up), it steers to one side. This is a common result from a burr on the teeth left from filing only from one side. To remedy this, take an extra stoning pass on the side toward which the saw is steering. This will remove the burr and even the cut in the kerf.

Sure, like everything, saw filing takes a bit of practice to get good at it, but it doesn't take too much time or effort to become at least competent. Take the time to learn how to sharpen your own saws, and you'll be amazed at how much better they work – and how much time and money you'll save over sending them out for sharpening. **PWM**

Stoning. *To remove burrs left by the filing, and to remove set, make no more than four passes down each side of the teeth with a fine India stone or #600-grit diamond stone.*

Matt lives in Warwick, R.I. He restores and sells vintage saws, and teaches classes on sharpening.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/dec14**

WEB SITE: *Find out more about saw sharpening on Matt's Cianci's site.*

TO BUY: *"Build a Custom Backsaw with Matt Cianci" (available on DVD or by download).*

Our products are available online at:

- **ShopWoodworking.com**

Not so Ordinary Router Cabinet

BY GLEN D. HUEY

Great shop storage isn't always built using plywood.

As I look around my shop, or most woodworking shops, I see cabinets built with plywood and screws. But there are other options. I decided to change things up and make a shop cabinet using hardwoods, and to use the project to experiment with a couple of different techniques.

I consider a router an essential woodworking tool. And because I have router bits and accessories stored in small boxes, stuck in drawers and in tool boxes (and hanging in less-than-ideal locations), a cabinet for all things router seemed the perfect project.

Build the Frame

The first order of business is to select and mill wood for the sides, top, shelves and center divider. Cut the top and sides to size, but leave the shelves and center divider 1/4" overwide and 1" overlong.

Dovetails are perfect to join the cabinet sides to the top; the joint – tails in the sides – holds up extremely well under the stress of heavy use and weight.

The dovetails are hidden by an applied moulding – and if I'm hiding the work, I don't wish to see any indication of the joinery. To pull off the disappearing act, cut 1/8"-deep rabbets on the inside face of the ends of the top. This reduces the apparent thickness of the top as seen from the ends, but doesn't give up any actual meat. Plus, the small shoulder helps hold the cabinet square during assembly.

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG FROM THE AUTHOR'S DRAWINGS

Think ahead. *A wide pin at the rear of the top provides a solid area into which the side rabbets terminate, without showing from the outside of the cabinet.*

A way to hide. *A small rabbet cut into the ends of the cabinet top easily allows the joinery to be covered with full-thickness mouldings.*

Not identical. *The dados don't match in the cabinet sides. Work carefully as you mark the layout.*

Lay out the pin board (the top) with a wide pin at the back. Make your saw cuts, remove the waste, then transfer the layout to the sides. Remember to set your marking gauge to match the remaining thickness on the top's end before scribing any lines. I use a band saw to define the tails, then clear away the waste with chisels and fit the dovetails. Because the joints are covered by moulding, they don't need to be perfect.

When the joints slip together, you can see the value of the rabbets and how they help to hold the cabinet square.

Position the sides on your bench with the insides up, rear edges touching. Mark the locations for all the shelves and the cabinet bottom. (All are 3/4" thick, excepting the 5/8"-thick router bit shelves . The tricky part is that the sides have different layouts. The left side has a 90° shelf and bottom and five router-bit shelves angled downward at 15°. The right-side layout is simply three 3/4"-wide dados, laid out following the plan.

Now calculate and cut the center divider to width (leave it overlong) and the long shelf to length and width. The vertical divider nestles into 1/4"-deep dados cut in the top and long shelf. Now's a great time to locate and mark the top and long shelf for those dados.

Router Jigs Work Best

It's time to cut the 1/4"-deep dados. I find two simple jigs are the best method of work. Each is built from scrap plywood and screwed together. The square platform jig is sized in thickness to work with a 3/4" pattern bit. (My bit has a 1 1/4" cutting length, so if it's to cut a 1/4"-deep dado, the jig has to be at least 1" thick.) Stack three pieces of 1/2" Baltic-birch ply, screw them together, then add a 1/2"-thick piece at one end to catch the workpiece and hold the jig square. (Fine-tune it as needed to bring the jig square to the workpiece.)

Align the jig to the left side of the cut and clamp it in position. A single clamp secures the jig. Rout the dado, allowing the bearing to ride against the jig. Stop your cuts about 1/2" from the front edge of the workpiece.

The angled dados are made the same way, except that the catch on the bottom of the jig is angled to match the layout. The router bit I used here is 5/8" in diameter; I set it up in a second router for more efficient work. Cut the angled dados into the cabinet side so the top edge of the dado is 4 1/2" long.

Before moving on, cut rabbets for the back and rear support (the peg board). I used a 3/4" wide x 7/16"deep rabbet that I cut in two passes at the table-saw. I also cut a 1/4"-deep rabbet along the back edge of the top to make sliding in the center divider easy. (This creates a slight gap at the sides, but it's covered by the moulding.)

Next, align the divider to the left side, then transfer the layout of the bit shelves. Mark both the top and bottom of the dados to account for the jig's placement – always to the left of the cut. Before routing the dados, the angle of

> "Design is as much an act of spacing as an act of marking."
>
> *—Ellen Lupton (1963-), Curator of contemporary design*

Jig No. 1. *A simple square platform jig in conjunction with a bearing-guided router bit makes quick work of the straight dados.*

Jig No. 2. *A second simple jig – this one set at an angle, then reset in the opposite direction – knocks out the router-bit shelf dados.*

No stack needed. *Cut rabbets in two quick steps at the table saw – first with the stick flat the table, then on edge.*

the jig needs to be reversed. Remove its catch, position the jig to the new layout lines, then locate and re-attach the catch in its new position. Rout the dados as before.

Now rout 90° dados into the top and the long shelf for the vertical divider. (See why I set up two routers?)

Puzzle Comes Together

To fit the interior pieces of the cabinet, cut the shelves to length, then notch them to step out of the dados. I use a table saw for this. Set the fence for 1/4" total cut (don't forget to account for the blade thickness), raise the blade to just more than 1/2", then, with a couple of quick passes, notch the ends.

Exacting layout. *The best way to mark for the opposing-angled dados for the center divider is directly off the cabinet side.*

Assemble the dovetail joints and slip the long shelf into position. With a couple of clamps holding things secure, fit the divider, making sure the angled dados align (small adjustments are easily made). Notch the ends at the table saw, then slip the divider into position.

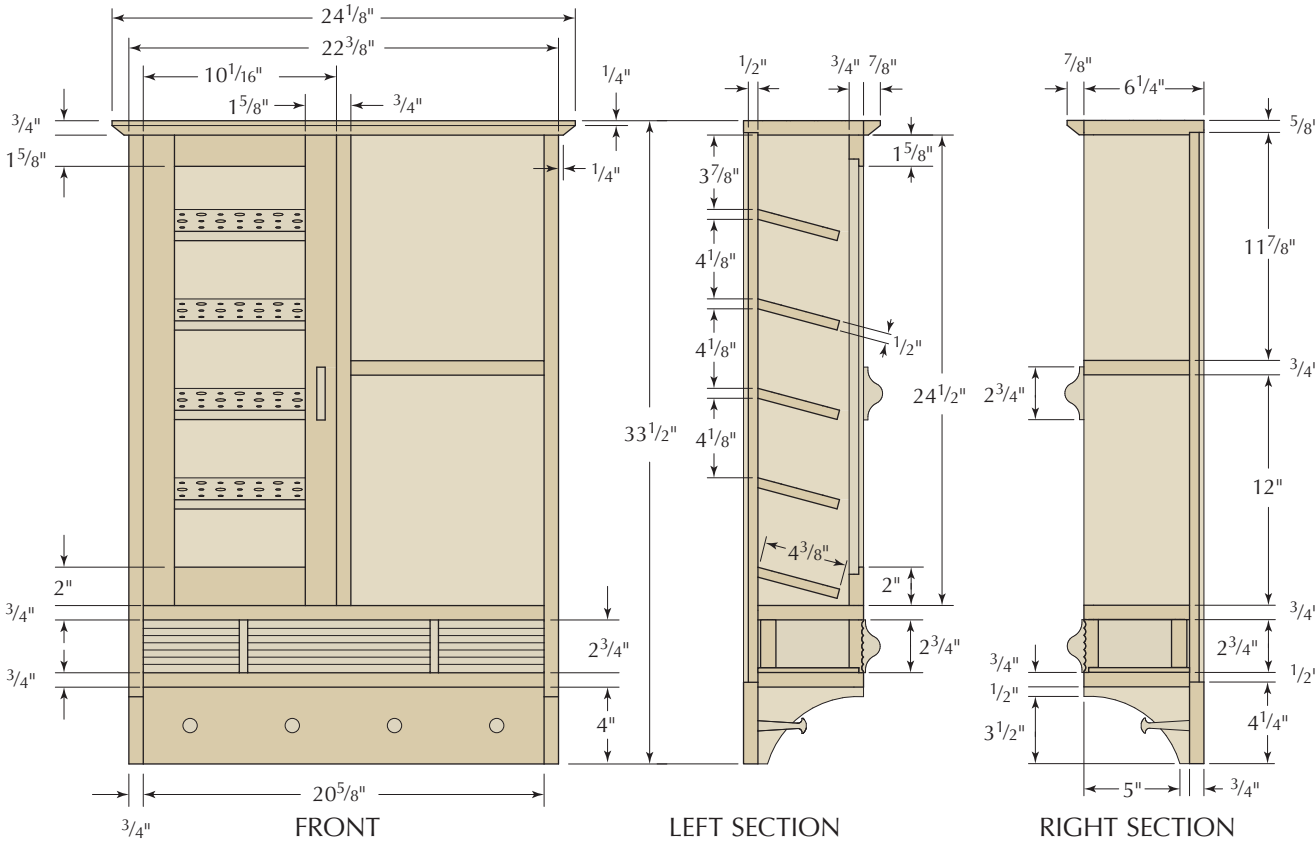
Next, mark the location of the router shelf on the divider. Measurements taken off the assembled cabinet better allow for level shelves. Cut the shelf to size and notch the ends before checking its fit. Repeat these steps to fit the bottom.

Now disassemble the cabinet and place the two sides inside up on your bench with the back edges matched. The last step is to lay out and cut the quarter-round design at the ends of the sides. The radius is 5"; the height is 3 1/2". To facilitate using a compass for layout, slide a scrap along the bottom edge of the matched sides, then draw the half-circle as shown at right. Make the cut, then smooth the edges.

Step out. *Each of the parts housed in dados (except for the bit shelves) need to be notched at the ends; it's a simple and clean process using a table saw.*

Sand the insides and assemble the cabinet. The two flat shelves, divider and bottom are fit in their dados and secured using screws and plugs. (It's simple, but this is a shop cabinet.) Glue and assemble the dovetails. Position the long shelf, then drill and countersink for the screws, two at each end. Repeat the steps for the divider and router shelf.

If you want to plug the divider holes in the long shelf, do that prior to attaching the bottom. There's little room to work after that shelf is installed. To



Get level. *Small adjustments to get the angled shelves aligned makes it better to mark the single router shelf dado directly off the side location; measure, mark then rout.*

Odd arc. *With the limited height of the arc, it's best to slip a scrap into position to more easily use your compass.*

Your choice. *The top moulding is attached to the cabinet to cover the dovetail joints. Use your favorite profile.*

wrap up assembly, fill the holes with plugs of matched grain, then after the glue dries, sand the surfaces smooth.

The cabinet is topped with a simple piece of moulding cut with one of my favorite ogee bits, a classic design. Attach the moulding using glue and pins. (Don't neglect to glue the miters.)

Now is the perfect time to add the rear support, which holds turned pegs. The support fits into the same rabbet you cut for the back. Two screws per end hold it in place. Lay out and drill for the pegs prior to installing the support.

Build the Door

Beginning woodworkers often build doors by joining the rails and stiles with mortise-and-tenon joints, then routing the back of the door using a rabbet bit. This results in a small section of exposed end grain at each corner. There is a better technique.

With just a couple of extra steps in the process, the rabbeted area is automatically formed in the assembled door. See "Build a Better Door" on page 45 for this method.

With the joinery on the rails and stiles complete, add glue to the joints, assemble the door in clamps and allow the glue to dry. (After your finish is applied, install a clear Plexiglas panel, holding it in place with 1/4"-square strips pinned in position.)

Drawer Joinery

Because this drawer is meant to house small parts and accessories, the joinery does not require superhuman strength. I built it using a down-and-dirty method: a lock joint cut at the table saw (the key to accuracy is set-up).

Mill your drawer parts to thickness, width and length. Install a dado stack in your table saw for a 1/4"-wide cut, and set the blade height to 1/4". Position the fence 1/4" away from the stack, then cut dados at the ends of the drawer sides.

Now rabbet the ends of the back. I use a step-off block to align the stack with the ends of the front and back; a sacrificial fence is another option. Raise the blade height to 1/2", then rabbet the 3/4"-thick drawer front.

With the blade height still at 1/2", switch over to a tenon jig to cut the tongues that lock into the dados . Position the jig and stack to cut dados leaving a 1/4" of material at the inside face, as shown below.

Amazing hold. *For small drawers, a lock joint has incredible hold. While the short grain is brittle before assembly, when locked together, the joint is plenty strong.*

Dado stack. *Here, I'm cutting a rabbet on the end of the drawer back. Note the step-off block to align the workpiece with the blade.*

Flush to the lip. *The last cut using the dado stack is to create the slot for the ends of the drawer sides. Position the cut at the top of the rabbet.*

SUPPLIES

Rockler
rockler.com or 800-279-4441

1 ▪ 8-pack walnut classic Shaker pegs
#21956, $10

Woodcraft
woodcraft.com or 800-225-1153

1 ▪ pair non-mortise hinges
#27G12, $2.25

2 ▪ 1/2" x 1/8" rare-earth magnets
#150951, $13.69

Prices correct at time of publication.

Router Cabinet

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑ 2	Sides	3/4	6 1/4	33 1/2	Walnut	
❑ 1	Top	3/4	6 1/4	22 3/8	Walnut	
❑ 1	Bottom	3/4	5 1/2	21 3/8	Walnut	
❑ 1	Long shelf	3/4	5 1/2	21 3/8	Walnut	
❑ 1	Vertical divider	3/4	5 1/2	25	Walnut	
❑ 1	Router shelf	3/4	5 1/2	10 9/16	Walnut	
❑ 5	Bit shelves	5/8	4 3/8	10 9/16	Walnut	One edge angle cut*
❑ 1	Rear support	3/4	4 1/4	21 3/4	Walnut	
❑ 1	Back	1/2	21 3/4	28 5/8	Plywood	
❑ 2	Door stiles	3/4	1 5/8	24 1/2	Walnut	
❑ 1	Upper door rail	3/4	1 5/8	9 5/16	Walnut	1 1/4" TBE**
❑ 1	Lower door rail	3/4	2	9 5/16	Walnut	1 1/4" TBE**
❑ 1	Drawer front	3/4	2 3/4	20 7/8	Cherry	
❑ 1	Drawer back	1/2	2 1/2	20 3/8	Poplar	
❑ 2	Drawer sides	1/2	2 1/2	5	Poplar	
❑ 1	Drawer bottom	1/4	5 1/2	20 7/8	Poplar	
❑ 3	Pulls	7/16	2 3/4	1	Walnut	
❑ 1	Crown moulding	3/4	7/8	48	Walnut	
❑ 4	Pegs		1/2	3 1/2	Walnut	

*Front and back edges are ripped at a 15° angle; **Tenon both ends

When the cuts are complete and the parts fit properly, rabbet the bottom edge of the drawer front for the 1/4"-thick drawer bottom. The bottom is pinned in place, but left overwide – you'll trim it to act as a drawer stop against the case back.

Drawer-front Design

A new approach for me was to texture the drawer front to add some visual interest with a series of grooves. I cut them with a 1/2" round-nose bit (also known as a core-box bit) at my router table, creating a series of small arcs in the front.

The secret (if there is one) is to start your layout, and the cuts, at the center of the drawer front and work toward the edges. Take the time to align the first cut down the centerline (it needs to be very close, but there is a bit of course correction possible from a second pass). After the first pass, reverse the front and make a second pass. This may widen your groove, but it will not be noticeable, and it guarantees you're centered. (As always, test pieces make setup easier.)

Slide your fence closer to the bit for the second and third grooves, making sure there is no flat between them. Repeat these steps for the fourth and fifth cuts (an odd number of grooves makes the layout much easier). With the drawer front textured, sand the grooves (a sandpaper-wrapped dowel works well), then glue up the drawer.

As the glue dried, I designed a few small pieces to use as pulls for the drawers and door. I began with 7/16"-wide stock, then laid out a simple undulating pattern. I made the cuts at the band saw, smoothed the pieces at a spindle sander and eased the edges using sandpaper.

The drawer pulls are set into dados cut in the drawer front. Determine the location for the pulls (I used them to equally divide the two sections of the cabinet), then make marks along the edge of the drawer front to show the start and stop points of the dados.

Set your table saw blade to cut just below the deepest point of your decorative drawer grooves and align the blade with your layout marks. Using the miter gauge, nibble away at the cuts until you've achieved the thickness of your pulls – check this with each pass when you get close to the second layout line. Repeat the steps for the second pull, then glue the pulls in place.

Wrap up work on the drawer by pinning the drawer bottom to the completed drawer box.

Fit & Finish

Fit the door to its opening, making any needed adjustments to its width and height. I used simple no-mortise hinges and a shop-made catch with two rare-earth magnets – one on the triangular catch, one buried in the door (don't glue the magnets in place before checking their polarity). The door pull is simply glued in place.

Lay out then drill holes in the router-bit shelves to accept the shafts of your router bits (for my layout, see the Online Extras – but know that your layout needs may vary). Before installing the shelves in the cabinet, plane or cut the rear edges at a 15° angle to match the slope of the shelves, then slip them into

Layout is key. *The first groove for the drawer-front texture should be perfectly centered in the face. (Or you can get darn close and make a second pass with the stock reversed.)*

Subsequent grooves. *Adjust the fence to make the next-in-line cuts in the texture pattern – working with grooves in odd numbers makes the layout work easier.*

Rather catchy. *A simple catch with a rare-earth magnet epoxied at the center is glued and pinned inside the door; another magnet is installed in the door.*

their dados. The cabinet back holds the angled shelves in place.

The back is plywood. Install it with screws after completing the finish.

Here, too, I, decided to switch things up a bit from my usual approach. Instead of shellac, I used a water-based topcoat – Enduro-Var from General Finishes. And to try it two ways, I brushed on the first coat, but sprayed the second after a thorough sanding with #320-grit. (I wasn't surprised to find that I preferred the sprayed coat.)

My first thought as I finished the cabinet was that, had I not angled the router-bit shelves, this piece could have found its way into my house. But with the bitshelves in place, I've built a nice shop cabinet from something other than plywood. Plus, I played with a couple of new techniques along the way. And I have a great cabinet to help get a handle on my router bits and accessories. **PWM**

Glen typically builds period furniture; this piece is purely from his imagination.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/dec14**

BLOG: *Learn how Glen Huey spaced the holes for his router bits' shafts.*

BLOG: *Build Glen Huey's cheap and simple router jig that's a workhorse in his shop.*

IN OUR STORE: *Download a copy of "Getting Started with Routers," by David Thiel.*

TO BUY: *Discover the router bits Glen recommends for those new to routers.*

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BUILD A BETTER DOOR

As we gain experience in woodworking, we find or learn new techniques that make our work better. A great technique to up your door-building game is to produce doors, which, with a few extra steps, have rabbets already in place for glass or flat panels. No more rabbeting after assembly.

Here's how it's done: Mill the rails and stiles to length, width and thickness, then lay out and mark the mortises in your stiles; I chose 1/4" shoulders for my tenons. Center the 1/4"-wide x 1 1/4"-deep mortises in the stiles as you cut or chop the four mortises.

Now rabbet the inside edge of all four door parts. Cut 3/8"-wide rabbets as deep as the front wall of your mortises (1/2"). I prefer the table saw for this task, but there are other methods.

How the tenons are cut on the rails is where the huge difference in technique comes to light. Set the blade height to 1/4" and set your fence to cut a 1 1/4" tenon. Don't forget to account for the 1/8" blade kerf. With the rail's front face against the tabletop, make a pass cutting the rail.

Next, leave the blade height alone, but slide the fence to cut a 7/8" tenon (1 1/4"-3/8" rabbet). Make a pass cutting the rear face of your rails at all four locations. Before moving on, rotate the rail so the outside edge is facing the tabletop and make another cut. (There is no cut needed for the inside edge – it was removed by rabbeting.)

The difference in the procedure when making the cheek cuts is that you have two different blade heights with which to work: 7/8" for the back face and 1 1/4" for the front. Plus, you'll need to remove the shoulder waste using a band saw or handsaw.

As you slip the joint together, the extended shoulder at the back and outside edge of the rails fills the rabbeted area just as the front face snuggles tight to the stile. The rabbet for the glass or flat panel is done – and with no unsightly end-grain in sight.

— GDH

1 *After completing the mortises, rabbet the door parts flush with the front wall of the mortises.*

2 *Set the fence to cut a 1 1/4" tenon with the blade set to just pierce into the rabbet.*

3 *Readjust the fence for a 7/8" tenon on the rail's back face.*

4 *Cut the cheeks using two different height adjustments – one for the front face and a second for the back.*

5 *As the joinery slips together, the longer back tenons fills the rabbeted area just as the front tenon settles against the rail's edge.*

Woodcarving Basics

BY MARY MAY

Learn techniques for 'shallow relief' and 'applied' carvings.

Have you ever been involved in something where you get completely absorbed in it? Where hours go by without realizing it? Those are the moments when you discover something you truly love.

Within a month of taking classes from European Master Carver Konstantinos Papadakis, I knew carving would be my life. I often found myself dreaming of my next project. When speaking with people, I would find myself studying their faces intently and wondering which gouge I would use to achieve those shapes. That's when I knew I was obsessed.

This article is a walk through the basics of getting started in carving so the idea and possibility of this art form can become a reality – and hopefully prevent injury, tears and frustration. Who knows? It might become an obsession in your life, too.

Two Approaches

Carving a shallow design directly into a flat board is the simplest way to start. This is referred to as "shallow relief carving," where the background is lowered with gouges and the carving appears to be raised off the surface. There's no sawing necessary, and it's easy to clamp your wood to a workbench.

There are two ways to carve shallow relief in a flat board. One is to lower the entire background flat and the other is to carve down at an angle close to the design. This technique can be used as a design on the top of a jewelry box, for example.

Another technique, referred to as "appliqué" or "applied carving," is

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR

Relief two ways. *The entire background of the shell at left has been lowered. At right, a series of angled cuts around the perimeter of the carving sets it off from the background.*

Apply yourself. *Carvings may also be separate from the background and applied to a panel after the carving is complete.*

to cut the outline of the design with a band saw or scroll saw before carving. When the carving is finished, it is glued to your piece of furniture. With this technique, the carving is attached to a temporary backer board. This process is explained in the "Clamp Without Damage" below.

Transfer a Design to Wood

One of the simplest methods to transfer a design to wood is to use carbon paper or transfer paper and trace a design. Carbon paper (from an office supply store) produces a blue or black line, while transfer paper (from a craft store) comes in a variety of colors. Lighter colors are more visible on dark woods, such as walnut or mahogany. Carbon paper is difficult to erase, while most transfer paper can be erased with a regular pencil eraser.

Another method is to trace around a template. This is approach is often used when the design repeats a pattern, and speed and accuracy of the transfer process are important.

Templates work well with patterns that have a mirror image. The template can be flipped on a centerline and a reverse pattern drawn.

A template, however, can make it difficult to transfer interior lines. Strategic holes in the template can help, but be careful how you cut the holes or your template may fall apart. You may need to complete any interior lines by hand.

"Creativity is allowing yourself to make mistakes. Art is knowing which ones to keep."

—Scott Adams (1957-), American cartoonist

Template Materials

For templates, a variety of materials can be used; I use card stock, flexible plastic or metal. A template works best if it has some thickness so a pencil can run along the edge. Use a white or colored gel pen, or a colored pencil, to transfer onto dark wood to see the drawing better.

To use manila folders or card stock as a template, glue a photocopy of the design to the heavy paper with spray adhesive, a glue stick or other adhesive. As this type of template is used, the outside edge will become worn and distorted. Put Super Glue along the edge of the template to keep it intact.

Plastic page dividers or disposable plastic chopping mats work well for templates. Because the plastic is transparent, the design can be easily traced. Keep in mind that the plastic will need to have at least one rough side to receive a pencil line, or you can use a marker that will write on smooth plastic.

Aluminum or copper can also be used as template material. These materials are especially useful for transferring a design to a curved surface because the material can form along a contour and hold a shape.

Another way to transfer a design is to use a photocopied image (from a toner copier, not an ink-jet printer). The image is transferred by turning the design over and rubbing over the paper with lacquer thinner or with a hot iron to release the toner ink to the wood. (Note: The wood must be smooth.)

This is a great method for transferring large detailed designs where the lines need to be transferred accurately.

Not all copy machines are the same. Some release every detail; with others, it's difficult to get a clean line. When working with solvents, work in a well-ventilated space and use proper safety gear (gloves, mask and safety glasses).

Clamp Without Damage

The best way to hold the wood while carving is to use bench dogs with a vise. I started on a kitchen table and held my carving with two bench clamps. (It's not great for the table if you slip, though!)

When using metal clamps, place pieces of wood, cardboard, cork or leather between the clamp and your wood to protect it from damage or dents. And be careful not to hit the clamps with your tools. (If the clamps get in the way, attach your work to a backer board.)

Repeat after me. *Templates make it quick and easy to duplicate a pattern, including complex shapes with interior elements.*

Lighten up. *On dark woods, a light-colored pencil or gel marker creates lines that are easy to see. Complete the interior lines by drawing freehand.*

***Temporary fix**. Paper glued between a backer board and a carving can be easily removed after the carving is complete.*

Carvings that are applied or glued to furniture are often cut out with a scrollsaw or band saw. This makes the carvings fragile and difficult to clamp. Attach the carving blank to a temporary backer board, then clamp that to your bench.

Find a board that extends several inches past your carving on all sides. Trace the pattern onto the board and spread white or yellow wood glue in this area. Place newspaper or brown paper over the glue, then cut the paper close to the shape of your carving.

Spread glue on the back of the carving, using enough to saturate the paper, but not so much that it seeps along the edge when clamped. If any glue does squish out, wipe it away with a damp cloth. It's best to clean any excess now rather than let dried glue interfere with your carving.

Place the carving on the backer board and clamp it flat. With larger or intricate carvings, place a board over the carving blank, then clamp to ensure even pressure on all parts of the blank. When the glue is dry, you're ready to get to work.

To remove the carving when you're finished, place a flat chisel or a sharp putty knife between the carving and the backer board and gently tap it with a mallet, working around the carving. The paper will split and release. Be careful; it is easy to break the carving in fragile areas.

Strong double-sided tape is better than the glue-down method for delicate carvings. I use ShurTape double-sided cloth tape, which can be purchased at most hardware stores. Woodturner's double-sided tape can also be used.

Trace the pattern on the backer board, then place double-sided tape over the outline. Remove the back of the tape, place the carving on the board and clamp. Remove any excess tape with a small knife – wood chips sticking to exposed tape while carving are annoying.

When the carving is finished, brush along the edge with a solvent such as acetone, lacquer thinner or denatured alcohol to release the blank from the backer board. Test to see what solvent releases your tape, using proper care and ventilation.

A Good Set of Tools

I prefer full-length gouges (9" to 11" long) over shorter palm gouges for safety and control. These are held with both hands, which keeps your hands away from the tool's sharp edge. One hand is always on the handle pushing the gouge, and the other hand is always on the metal shank guiding the cut.

Most European tools are identified with two numbers, such as a 14mm, No. 5. The "mm" is the width in millimeters and the "number" refers to the curvature, or "sweep." No. 1 is a flat chisel and as the numbers increase from 2 to 11, the curve increases.

I prefer fishtail-shaped gouges because they fit nicely into corners. Straight gouges are for more heavy or sculptural carving. Most European woodcarving gouges are good quality and I use tools from a variety of makers.

Brass, steel, wooden or rubber mallets work well at a weight of 1 to 1½ pounds. Wooden mallets are better for heavy pounding and removing a lot of wood because they do not damage gouge handles. Brass or steel mallets work well for lighter tapping and controlled cuts. I use metal mallets for all my carving because I prefer their small size.

If you like, wear fingerless gloves to protect the sides of your hand from the rough edges of the wood. Kevlar carving gloves can also be used to prevent cutting your fingers.

***Within reach.** These two gouges are the same size and sweep, but the fishtail gouge at the top is more versatile. It can cut into corners and other tight spaces.*

Basswood and butternut are the best woods to start with. They are soft and easy to work. For more advanced carving projects, mahogany and walnut are good woods to tackle after learning the basic techniques in softer, more forgiving species.

Start with Good Techniques

Position the wood with the grain parallel to the edge of the bench so that most cuts are made to the right and left, instead of toward and away from your body. Keep the base of the hand holding the metal shank of the gouge on the wood at all times. This creates a pivot that controls and guides the tool.

Most people have one hand that is dominant. This hand feels more natural holding the handle of the gouge and the less dominant hand holds the metal shank. But the carving process is more efficient and flexible when you can switch back and forth between your right and left hand.

With basic relief carving, the ideal

***Get a grip.** Use both hands on the gouge for control and safety. Keep the hand that holds the metal shaft in contact with the wood and use it to pivot the tool.*

1 ***Correct grain direction.*** *Using a 14mm, No. 3 gouge, round over one side of the leaf, starting this cut at the peak of the curve where the grain switches direction. Work downhill to stay in control and to prevent the wood from splitting ahead of the cut.*

2 ***Also correct grain direction.*** *Reverse direction at the peak of a curve to follow the grain. Learn to hold the handle with either hand to work efficiently.*

work height is an inch or two below elbow height. This allows you to lean into the work without bending too far. If the workbench is higher than your elbows, you will lift your shoulders too high; if it is lower, you can strain your back.

If you are able to, stand to have the most flexibility while carving. This allows you to shift your entire body for better leverage and access to the carving. It also allows you to lean and use the weight of your body to make cuts, rather than relying on arm strength. I have had several students who are confined to wheelchairs and they have been successful using small laptop benches.

Never cut toward yourself. Even if it seems like there is enough wood between you and the gouge, make it a habit to never point the gouge toward your body – even if it is just a small cut. Turn the wood around if needed to stay safe.

Carving a Simple Leaf

One of the most challenging parts in learning to carve is figuring out how to cut in the correct grain direction. As a teacher, this is also one of the most difficult things to explain. Sometimes the best way to discover this is to put the gouges to wood and see what happens. If it fights with you, turn around and go in the other direction.

To get a basic idea of how the grain works in carving, study the eight numbered photos on this page and the next,

BASIC TOOLS & EQUIPMENT

The tools in my preferred sets are mostly the sizes I used when I started carving. I became accustomed to these particular sizes and shapes. The tools in these sets can vary slightly in width and curvature, but they are a good general set of tools. You can add tools as you find a need for them. — MM

Begin with the basics. *The assortment of gouges at right can create a surprising variety of shapes and allow you to get a good start in carving. From top:*

- *6mm V-chisel*
- *6mm, No. 3 gouge*
- *14mm, No. 3 gouge*
- *14mm, No. 5 gouge*
- *10mm, No. 7 gouge*
- *10mm, No. 8 gouge*

Add as needed. *As you gain experience, you will discover the need to add to your set of carving tools. This group will take you to the next level. From top:*

- *6mm V-chisel (60°)*
- *14mm, No. 1 gouge*
- *3mm, No. 3 gouge*
- *6mm, No. 3 gouge*
- *14mm, No. 3 gouge*
- *18mm, No. 3 gouge*
- *12mm, No. 4 gouge*
- *5mm, No. 5 gouge*
- *14mm, No. 5 gouge*
- *6mm, No. 7 gouge*
- *10mm, No. 7 gouge*
- *14mm, No. 7 gouge*
- *10mm, No. 8 gouge*

3 ***Meet in the middle.*** *To carve the hollow of the leaf, use a 14mm, No. 3 gouge to carve down from both sides to meet at the bottom of the hollow.*

4 ***Define the edge.*** *Using a 14mm, No. 5 gouge, continue shaping the hollow section of the leaf by carving along its perimeter. Notice the direction I am carving. This will also create a sharp, high leaf edge.*

5 ***Across the grain.*** *To finish defining this part of the leaf, make a gentle slicing cut across the grain at the bottom of the hollow. This technique of cutting across the grain is very useful when making these final clean-up cuts.*

in which I carve the simple leaf design.

If you have never carved before, start with a simple design. This helps get the feel of the tools and basic carving cuts. Base your design on something in nature because there are so many wonderful references – go outside and pick a flower or leaf and place it on your bench for reference. Find a nice soft piece of basswood, get a basic set of carving gouges and escape into the wonderful world of woodcarving. Watch out – once you start, you could get hooked! **PWM**

Mary is a professional woodcarver in Charleston, S.C., who offers classes in her workshop and other locations. She also has instructional DVDs available and offers an online video woodcarving school.

6 ***Finish shaping.*** *Using a 14mm, No. 3 gouge, finish rounding over the other side of the leaf to complete the shape.*

7 ***Vein line.*** *With a 6mm V-chisel, carve the center vein of the leaf, making sure there is a gentle curve to this line. With a 14mm, No. 3 gouge, round over the leaf so that it curves down toward the center vein.*

8 ***Final Details.*** *Finish up by making several small vein lines with a 3mm V-chisel. A shallow undercut around the perimeter of the leaf removes saw marks and cleans up the outside edge.*

ONLINE EXTRAS

For links to all online extras, go to:

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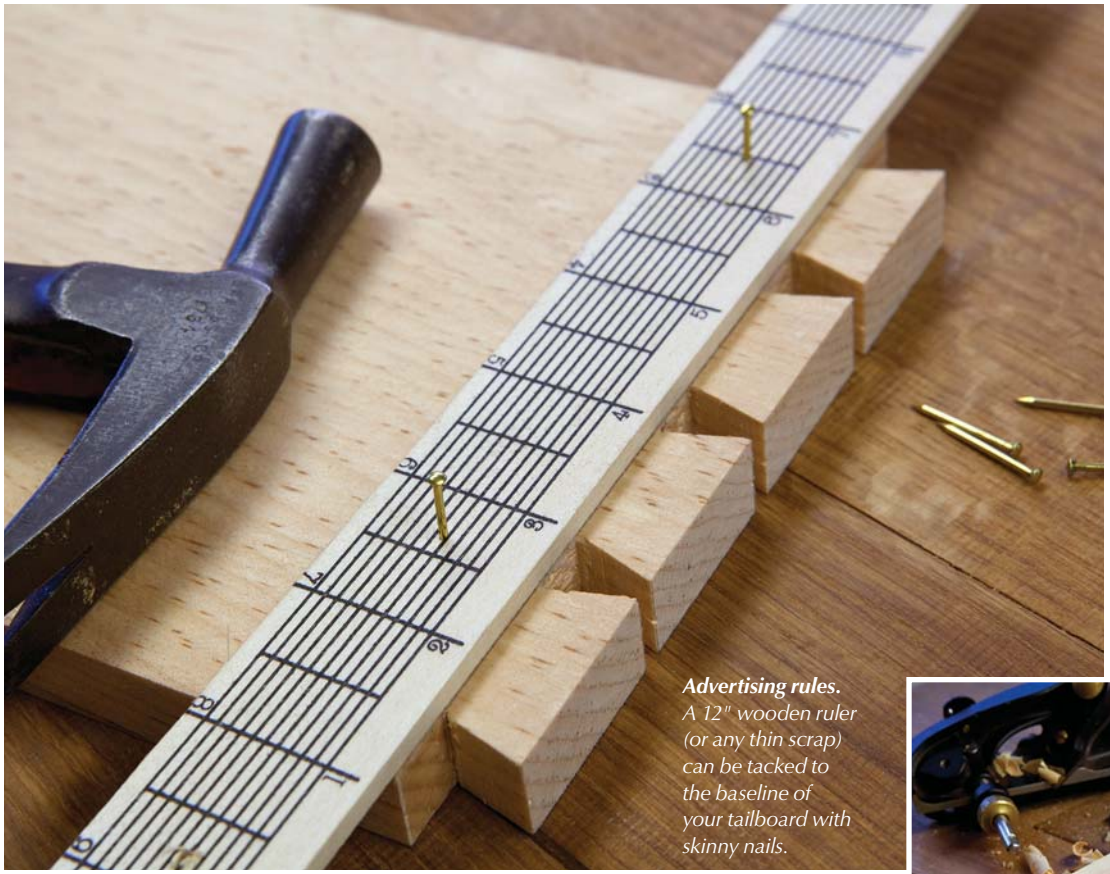
Dovetail Ruler Trick

BY CHRISTOPHER SCHWARZ

A throwaway wooden ruler prevents fatal errors when dovetailing.



Advertising rules. *A 12" wooden ruler (or any thin scrap) can be tacked to the baseline of your tailboard with skinny nails.*

The rabbet trick. *For years I've shown students how to cut this shallow rabbet to make it easy to transfer the shape of one board to another during dovetailing.*

The No. 1 mistake made by first-time dovetailers has nothing to do with sawing or chopping – the obvious choices.

Instead, I've found that most fatal mistakes happen at the point where the shape of the first half of the joint – the tailboard or pinboard – is transferred to its mate.

During the transfer process, beginners fail to align the boards properly, or a board shifts during the transfer process. The end result is that the joint is horribly misaligned or, worse, it won't go together.

To fight this alignment problem, I used to show beginners how to cut a shallow rabbet on the inside of the tailboard to help the two boards mate easily during the transfer process, reducing errors.

This strategy works great – if you can cut a square, well-placed rabbet. To be honest, it is difficult to teach beginners to do this with a rabbet plane at the same time they are also learning to knife, chisel and saw a dovetail joint.

I was beginning to wonder if the rabbet was more trouble than it was worth.

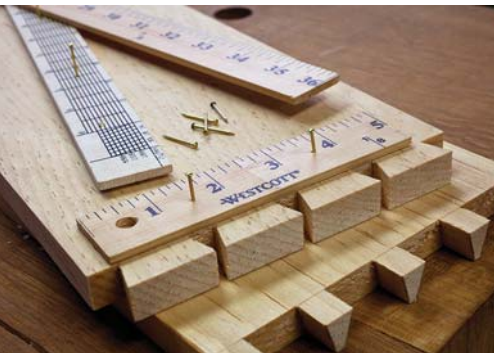
Inspiration in the Junk Drawer

One day I was pawing through a bin of tools and parts that I'd been meaning to get rid of when I came across a stack of wooden 12" rulers branded with advertising – the kind you can often get free at hardware stores.

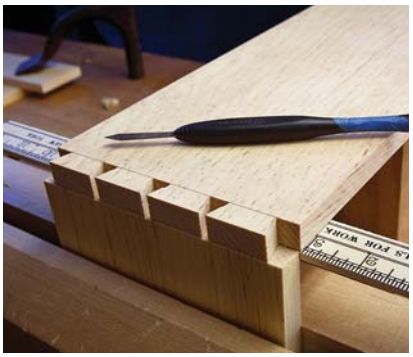
Something clicked. I grabbed the rulers and strode to the shop to experiment with some dovetails with this idea in my head: Instead of cutting a rabbet to help register the pinboard and tailboard, could I create a "rabbet" by tacking a ruler to the baseline of the tailboard?

The answer is "yes," and it has made teaching dovetailing a great deal easier for me.

PHOTOS BY THE AUTHOR



Big or small. *It matters not if the ruler is shorter or longer than the tailboard's width. All that matters is that it's planted on the baseline.*



On your mark. *The ruler allows the tailboard to lock to its mate right at the baseline. Now you can focus on transferring your layout.*

About the Ruler

All you need to try this is a wooden 12" ruler (or a paint-stirring stick) and a couple of nails with narrow shafts and sharp points. Escutcheon pins are a good choice, as are headless brads.

The goal is to fasten the ruler with one of its edges on the baseline of the tailboard. Pins work best for me, though you might consider using double-sided tape or hot-melt glue.

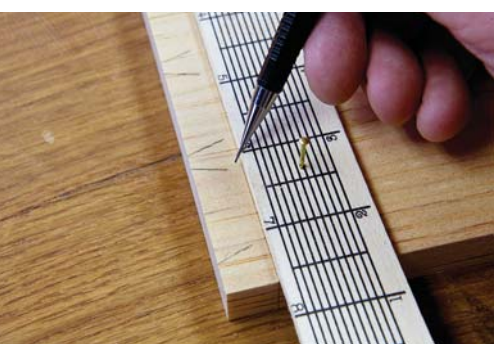
Before tacking the ruler down, I drive the nails most of the way through it. Then I place the ruler on the baseline and drive the pins into the tailboard about 1/8" or 3/16" deep. (If you have trouble aligning the ruler on the baseline, try driving in one fastener only, make any final adjustments then drive the second.)

That's the trick. Here's how it works.

Make the Transfer

Now transfer the shape of one board to the other. Place the tailboard with the ruler against the pinboard, which I place upright in a vise. Shift the tailboard to align the two at their long edges.

Yup, it works. *If you cut your dovetails pins-first, you can still use a ruler to help align the two boards during the process.*



Don't miss your mark. *Because of the thickness of the ruler, you won't be able to mark all the way to the baseline when cutting half-blind dovetails pins-first. But the slope is already set by the saw's kerf by the time you reach this area. So it's not a problem.*

> "Rules are for the obedience of fools and the guidance of wise men."
>
> *— Douglas Bader (1910-1982), British war hero*

Use a knife or pencil to scribe the shape of the joint onto its mate. If you cut your tails first, this trick works easily with both through-dovetails and half-blind dovetails.

For Pins-first Dovetailers

This trick also works if you cut your dovetails pins-first. Cut your pins as usual. Affix the ruler to the baseline of the tailboard. Then place the pinboard against the ruler and draw in the shapes of the tails on the tailboard.

The only fly in the ointment is when cutting half-blind dovetails pins-first. Depending on the thickness of your ruler, you might not be able to mark all the way down to the baseline of the tailboard. My ruler was a bit thicker than 1/8" and I could mark down to almost 3/16" from the baseline. This isn't a big deal – the shape of the tail is already set by the saw's kerf by the time you reach the base of the tail.

After the transfer is complete, pry the ruler off the tailboard and use it again.

My favorite part of this technique is wondering what the furniture conservators of the future will make of the two little holes on my tailboards. **PWM**

Christopher is the editor at Lost Art Press and the author of "The Anarchist's Tool Chest."

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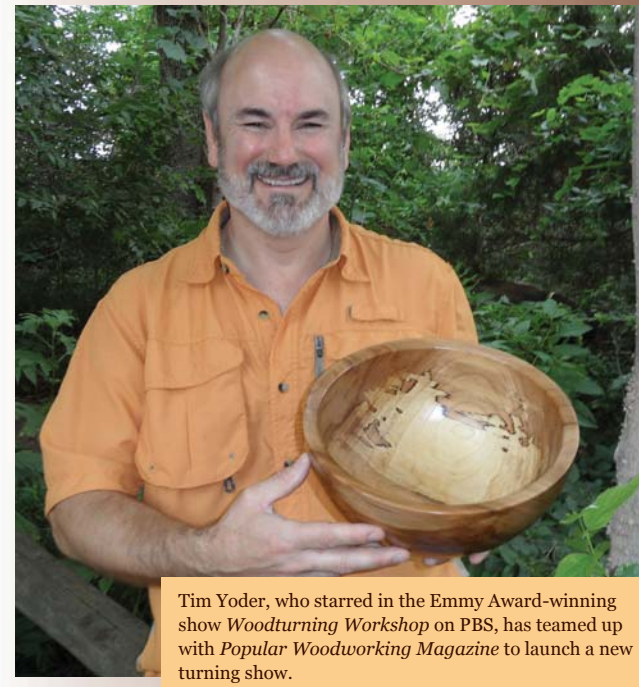

Tim Yoder, who starred in the Emmy Award-winning show *Woodturning Workshop* on PBS, has teamed up with *Popular Woodworking Magazine* to launch a new turning show.

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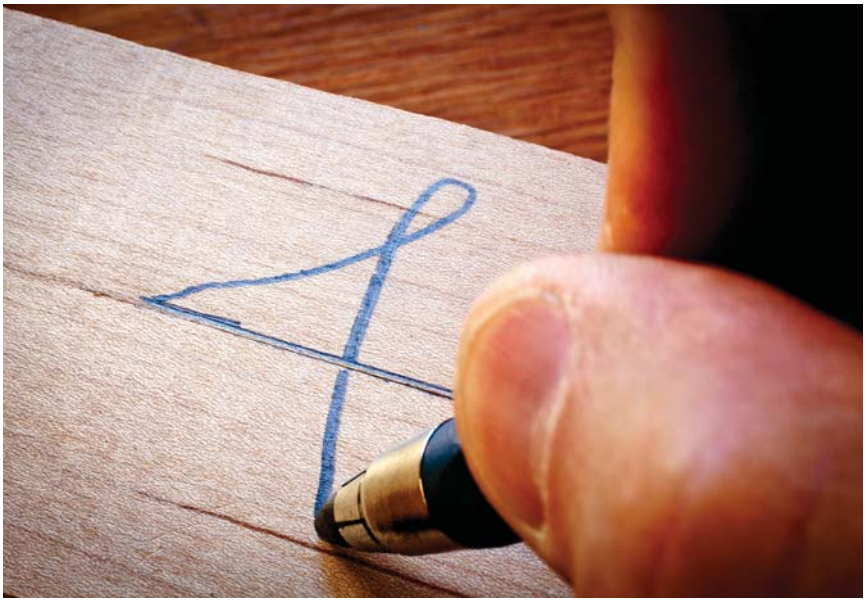
Make Your Mark

Traditional woodworking marks are simple – and they prevent errors.

If you don't use a clear system of marking your project parts, it's easy to get confused and cut a joint on the wrong face of a board or assemble table legs in the wrong orientation.

During the last 20 years, I've seen every imaginable marking system in use by my colleagues and students (even a system that relied upon "true north"), and I have yet to find a scheme that works better than the simplest traditional marks.

With a single swoop of a pencil, you can designate what is up, down, inside and out on an assembly. And you can indicate which parts of a board are flat, straight and at 90° to one another. Best of all, if you use these marks, anyone can decipher them (including yourself when you return to a project after a long absence). Here are the basics.



***Mark my words**. Use a traditional system of marking your parts to save time, errors and pencil lead.*

This is Flat

When you dress rough stock, you typically begin by flattening one face of that board and proceed from there. After you flatten a face, it is customary to mark it with a "true face" mark. The mark looks like a pig's curly tail and should begin on the edge that you intend to straighten during the next step.

I make the end of the mark so that it points in the direction that the grain runs on that face, though I've never found an old book that indicates that it's proper to do so (but it sure doesn't hurt).

Craftsman David Charlesworth uses a true face mark that makes the grain direction even more obvious. The curly tail of his true edge mark spirals several times to form an arrow that indicates the grain direction of the board.

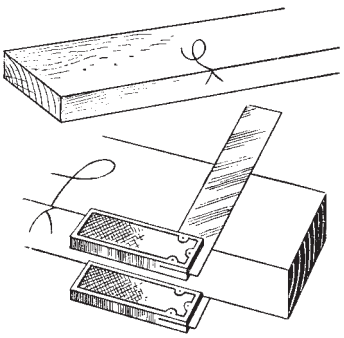
This is Straight

After creating a true face, it is customary to shoot one edge straight. This becomes the "true edge" of the board and is both 90° to the true face and perfectly straight. The mark for this is sometimes called a "caret," but is nothing more than a "V" shape where the vertex of the "V" touches the end of the tail of your true face mark.

I've seen several kinds of true edge marks. The most common is a simple "V," though Charles Hayward, a traditionally trained English woodworker and author, shows a slightly different version. His true edge mark looks more like a lower-case "h" than a "V."

After using both marks, I prefer Hayward's, though it takes a half-second

***On your mark.** The "true face" mark (left) labels this surface as flat and it typically also indicates the inside surface of a cabinet. The second mark (right) is a modern mark used by David Charlesworth. The curls form a point that indicates the grain direction of the board.*



***Both are true.** The mark at top is more common and is a simple "V." The second mark above, shown in Charles Hayward's classic texts, is slightly more complex but will help you avoid confusing it with part of a cabinetmaker's triangle.*

CONTINUED ON PAGE 61

PHOTOS BY THE AUTHOR

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CONTINUED FROM PAGE 58

more to make. As you'll see shortly, a simple "V" can occasionally cause confusion.

This is Square

To be honest, I haven't seen many marks that are used on the ends of boards to indicate that the end is square. When I was first taught machine woodworking, my teacher would put a simple vertical line on an end that had been squared on the table saw.

This mark, however, has tripped me up a few times. When dovetailing a board with this mark, it is easy to get confused as to which line is which. So I don't use that mark anymore.

When I need to indicate that a corner is square, I mark that information on the face of the board, a mark I first learned in Hayward's iconic "Cabinet Making for Beginners" (Drake). This mark is a simple arc on the square corner with an "R" written inside the arc.

I use this same mark for angles other than right angles. When I have corners at unusual (but similar) angles, I'll mark the corner with an arc and write the measurement in degrees inside – 92° for example.

The Cabinetmaker's Triangle

Once you get all your boards marked out, there are additional marks that can help you keep the ends, top and bottom of a carcase in order as well. The most common of these marks is called the "cabinetmaker's triangle" and it is (surprise) a triangle that is marked across multiple pieces of an assembly.

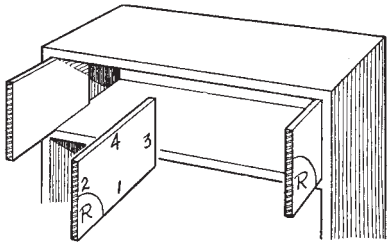
Typically, the triangle is placed on the front or top of an assembly, though you can put it on the bottom or back if you prefer. The triangle usually points to the front or top of an assembly.

If this is confusing, check out the photo at bottom left, that shows the triangle at work on some drawer parts. There are two triangles – one for the drawer sides and one for the drawer's front and back.

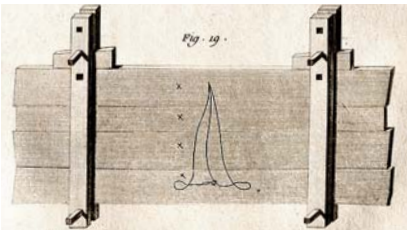
There is a French variant of this triangle that has two additional curls at the bottom corners plus a vertical line that bisects the triangle. This fancy French triangle actually helps you avoid confusion. The additional curls prevent you from confusing a partial triangle with a true edge mark.

Is that a cutline? *This simple vertical line can easily be confused with other layout lines on your board, so be careful.*

Triangles at work. *Here you can see the triangles for a drawer. All are marked on the top edge of the boards. You can easily discern what is front, back, left and right with little chance of confusion.*



The right mark. *At times, Hayward indicates a corner is square by scribing an arc on the face of the board and writing an "R" inside, much like what you see in geometry textbooks.*



Swoopy French*. A.J. Roubo uses this cabinetmaker's triangle in his 18th-century book, "l'Art du menuisier." It is not just for looks – it can help you avoid errors.*

True edge or triangle? *On an edge, the simple caret can be confused as part of a simple cabinetmaker's triangle. If you use the French triangle, however, you will avoid this occasional head-scratching moment.*

Or Use Lines

There are other systems out there for marking boards so you can assemble them in a particular order. Hayward shows a system in which you scribe a number of hash marks across the joint line when you are edge-gluing several boards to make a panel.

You put one mark across the first joint, two marks across the second joint and so on.

In my experience, most woodworkers resist using these marking systems at first and prefer to devise systems of their own. However, after trying out these marks on one project, I think you'll see how elegant and economical they are. **PWM**

Christopher is the editor at Lost Art Press and the author of the book "Campaign Furniture."

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Catalyzed Finishes

Apply a professional, quick-drying and durable finish at home.

You may have heard of catalyzed finishes: pre-catalyzed lacquer, post-catalyzed lacquer and catalyzed or "conversion" varnish. These finishes are commonly used in industry and in cabinet and professional refinishing shops. But there's no reason you can't use them also.

The primary advantages of catalyzed finishes are their durability, which is similar to oil-based polyurethane, and their fast drying, which is similar to nitrocellulose lacquer. The fast drying significantly reduces dust nibs on horizontal surfaces, and runs and sags on vertical surfaces, and it makes possible the application of all coats in a single day.

The disadvantages are the more irritating solvents and acid catalysts used (so you need a good exhaust system and maybe an organic-vapor respirator mask), the fast drying that makes application with a spray gun almost essential, and the availability only in gallon-or-larger sizes. Also, compared to lacquer, shellac and water-based finish, catalyzed finishes are much more difficult to repair invisibly if they should get damaged.

Catalyzed finishes are usually available at paint stores and distributors that cater to the professional trades. I've never seen these finishes at home centers.

Spraying. *There's nothing special about spraying catalyzed finishes; they spray similarly to nitrocellulose lacquer.*

The Ingredients

The distinguishing feature of catalyzed finishes, and the ingredient that gives them their name, is the acid catalyst that is added to make them cure. All solvent-based finishes referred to as catalyzed finishes employ the aid of an acid in the curing process.

In addition to the acid, these finishes contain an alkyd resin and one or both of the amino resins: melamine formaldehyde and urea formaldehyde. Most also contain nitrocellulose lacquer.

The alkyd and amino resins are crucial to these finishes. You can't turn nitrocellulose lacquer into a catalyzed finish simply by adding an acid catalyst to it.

Defining the Types

There are three large categories of catalyzed finish: catalyzed ("conversion") varnish, post-catalyzed lacquer and pre-catalyzed lacquer.

When the acid catalyst is packaged separately from the finish and no nitrocellulose is included, the finish is commonly called catalyzed or conversion varnish. Because this finish cures entirely by the crosslinking that occurs between the alkyd and amino resins, it is the most durable of the catalyzed finishes. But without the nitrocellulose, the finish dries slower and is more finicky.

When the acid catalyst is packaged separately from the finish and nitrocellulose has been added, the finish is commonly called post-catalyzed lacquer. The added nitrocellulose makes this finish a little easier to use because it hardens faster and bonds better between coats and over stains and glazes. The nitrocellulose also makes the finish a little easier to repair, but it weakens the finish slightly against wear, water, heat, solvents, acids and alkalies.

You can distinguish between these two finishes by the thinner used. Catalyzed varnish thins with toluene (toluol), xylene (xylol) or a similar proprietary manufacturer's solvent; post-catalyzed lacquer thins with lacquer thinner.

When a weaker acid catalyst is included in the finish along with nitrocellulose, the finish is commonly called

PHOTOS BY THE AUTHOR

pre-catalyzed lacquer (or "pre-cat"). It's the easiest of the catalyzed finishes to use (very similar to using nitrocellulose lacquer itself), but it's also the least durable of these finishes. Nevertheless, it's still as durable as oil-based polyurethane varnish, so it's durable enough for most situations.

All catalyzed finishes are available in various sheens including gloss, satin and flat.

If you are considering trying a catalyzed finish, I recommend beginning with pre-catalyzed lacquer, which is ready to use right out of the can.

Adding a Catalyst

With post-catalyzed lacquer and catalyzed varnish, you have to add the catalyst yourself (unless you find a distributor who will do it for you), and you have to follow the manufacturer's directions exactly. These directions differ among brands.

If you add too little catalyst, the finish won't harden properly. If you add too much, the finish may develop a haze or "acid bloom," which will continue reappearing even after you wipe it off.

Because the curing begins immediately after the catalyst is added, you have a limited time to get the finish applied or it will harden in your spray gun, possibly ruining it. This is called the finish's "pot life." It varies from several hours to several days, depending on the brand.

Adding catalyst. *To initiate the crosslinking of the amino and alkyd resins, you have to add the acid catalyst to catalyzed ("conversion") varnish and post-catalyzed lacquer before beginning to spray.*

Cracking & peeling. *Catalyzed ("conversion") varnish is the most finicky of the catalyzed finishes, partly because of the difficulty getting a good bond over stains, glazes, other finishes and even over itself. In this instance, the catalyzed varnish was applied over old nitrocellulose lacquer and began cracking and peeling soon after.*

Moreover, there are often specific rules for applying each coat, and a window for getting all the coats applied to avoid bonding or wrinkling problems.

Catalyzed Finish Problems

Pre-cat is very forgiving, similar to nitrocellulose lacquer. But post-catalyzed lacquer and, especially, catalyzed varnish are less so. You need to be familiar with the common problems so you can avoid them.

The most unique is excessive film build. These finishes get so hard that they crack if the film build is too thick. This cracking may not show up for months. Most manufacturers caution you to keep the total film build under five mils (five-thousandth of an inch), which is about three coats.

All finishes are sensitive to temperature during drying, but catalyzed finishes are more so than most. The temperature during application and for up to six hours afterward should be kept above 65° (70° is better) or the finish might not cure properly.

Because of their high solids, catalyzed finishes often don't bond well to wood that has been sanded to too fine a grit, especially to tight-grained woods such as maple and birch. The best practice is to sand no finer than #-220 grit just before applying the finish.

Durable, but…. *Catalyzed ("conversion") varnish is the most durable of the catalyzed finishes. But after it has aged a number of years, it can still be damaged. When this happens, the damage is often very difficult or impossible to repair. In this case, a 30-year-old finish was damaged by a hot pizza. Spraying a slow solvent or abrading, which are both effective on nitrocellulose lacquer, had no impact. The table had to be refinished.*

Alternatively, for the first coat you can use a stearate-free "vinyl" sealer, which is water resistant and should be available from the same suppliers. (Catalyzed finishes don't bond well to sanding or vinyl sealers that contain stearates.)

Bonding to stains, glazes and pore fillers can be a problem, especially with catalyzed varnish. To ensure good results, perform the decorative steps within washcoats (highly thinned coats) of vinyl sealer, then apply the topcoats of conversion varnish.

Above all, when using a catalyzed finish with the acid catalyst supplied separately, follow the directions of the manufacturer. **PWM**

Bob is author of "Flexner on Finishing," "Wood Finishing 101" and "Understanding Wood Finishing."

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How a Tree Became a Whale

A rescue and careful work reveal the spirit of land and sea.

I have lusted for years after the wide, irregular planks used by the legendary George Nakashima to capture what he called "the soul of a tree." I would give them new life as a piece of furniture emphasizing the natural figure and sculpted edges of the wood, just as he did for decades.

I thought I would never be lucky enough to acquire such a marvelous gift of nature.

It turned out I was wrong. We stopped at a tiny village during one of our yearly cruises through southeast Alaska, and as I walked across a bridge from the dock to the shore, I saw what I had yearned for all those years.

It was beautiful, even from a distance – a wide piece of wood, gracefully arched, and the lapping water of a receding tide was about to drag it out into the bay. It would probably end up on a distant shore, wasted by pounding surf and harsh weather.

Determined not to let that happen, I raced into the quaint village and found the local sawyer who had recently harvested a dying yellow cedar.

"What will it cost me to take that piece of wood off your hands?" I asked him, pointing toward the bay. "If you can carry it you can have it," he answered.

Minutes later, it was on the aft deck of my boat – where, because of a back injury the following week, it would remain, unprotected, for three months. Friends finally retrieved my boat for me because I was in no shape to run it. When they returned to our home in Juneau, I was amazed to see the plank still on the boat, badly weathered, but seemingly undamaged.

It looked horribly neglected, reminding me of this paragraph in Nakashima's autobiography:

"We are left in awe by the nobility of a tree, its eternal patience, its suffering caused by man and sometimes nature, its witness to thousands of years of earth's history, its creations of fabulous beauty. It does nothing but good, with its prodigious ability to serve, it gives off its bounty of oxygen while absorbing gases harmful to other living things. The tree and its pith live on. Its fruits feed us. Its branches shade and protect us. And, finally, when time and weather bring it down, its body offers timber for our houses and boards for our furniture. The tree lives on."

I knew Mr. Nakashima would disapprove if I failed to find this tree's soul. So I began working the wood, first with handplanes and finally with my random-orbit sanders, revealing the troubled story of the tree's entire life. The tree had been bent, probably by a heavy snow load, and the inside curve of the wood was rippled, framing complex figuring that resulted from the stress of that deformation.

But slowly, something else emerged. The tree had become a whale. Not an anatomically perfect whale, but clearly a whale, like the great animals that inhabit the very waters where I found the slab.

The soul of a tree had become the soul of a whale.

I'm haunted by another paragraph in Mr. Nakashima's book.

"The tree's fate rests with the woodworker. In hundreds of years its lively juices have nurtured its unique substance. A graining, a subtle coloring, an aura, a presence will exist this once, never to reappear. It is to catch this moment, to identify with this presence, to find this fleeting relationship, to capture its spirit, which challenges the woodworker."

Now, my treasured plank is more than a whale. It's a table, with folding legs so it can hang on a wall when it's not in use. It's the most beautiful piece I've made in 50 years of woodworking, and that's not because of my skill. It's because Mr. Nakashima was right. That tree had a soul. **PWM**

Lee has been writing about science longer than he cares to remember, but his real passion is woodworking. He prefers local woods found near his home in Juneau, Alaska.

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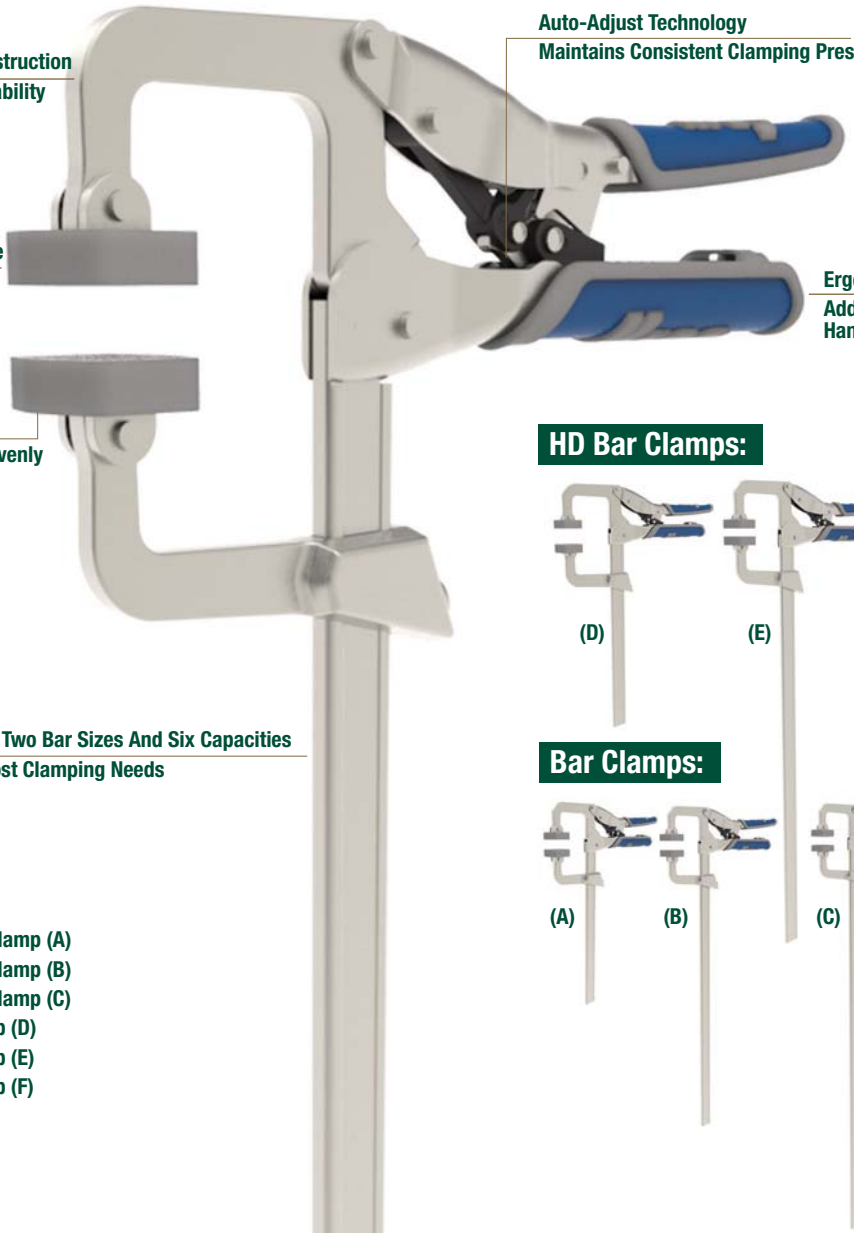

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